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Scheller et al.

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(45) Date of Patent: Aug. 18, 2015

(54) **STEERABLE LASER PROBE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 342 days.

(21) Appl. No.: **13/602,024**

(22) Filed: **Aug. 31, 2012**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 61/555,268, filed on Nov. 3, 2011.

(51) **Int. Cl.**

A61B 18/18	(2006.01)
A61B 17/00	(2006.01)
A61B 18/22	(2006.01)
A61F 9/008	(2006.01)
A61B 19/00	(2006.01)

(52) **U.S. Cl.**

CPC ***A61B 18/22*** (2013.01); *A61B 2018/2238* (2013.01); *A61B 2019/2242* (2013.01); *A61B 2019/2246* (2013.01); *A61F 9/008* (2013.01)

(58) **Field of Classification Search**

CPC A61F 9/008; A61B 2019/2242; A61B 2019/2246

USPC 606/1–19; 607/88–94

See application file for complete search history.

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Primary Examiner — Lynsey Crandall
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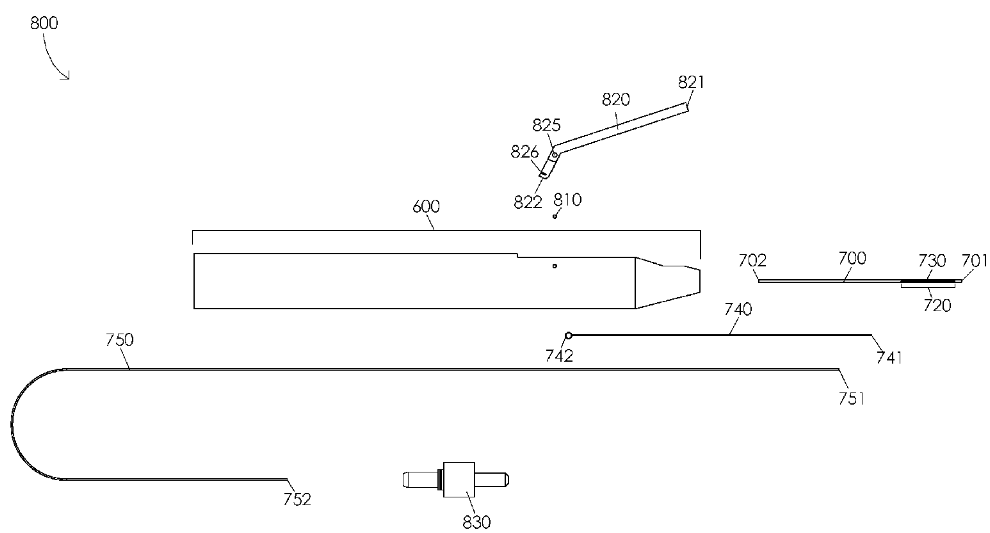
(57) **ABSTRACT**

A steerable laser probe may include a handle, an actuation lever, an optic fiber, and a housing tube. The housing tube may have a first housing tube portion having a first stiffness and a second housing tube portion having a second stiffness. The second stiffness may be greater than the first stiffness. The optic fiber may be disposed within the housing tube and within an inner bore of the handle. An actuation of the actuation lever about a pivot pin of the handle may gradually curve the optic fiber. An actuation of the actuation lever about the pivot pin of the handle may gradually straighten the optic fiber.

19 Claims, 40 Drawing Sheets



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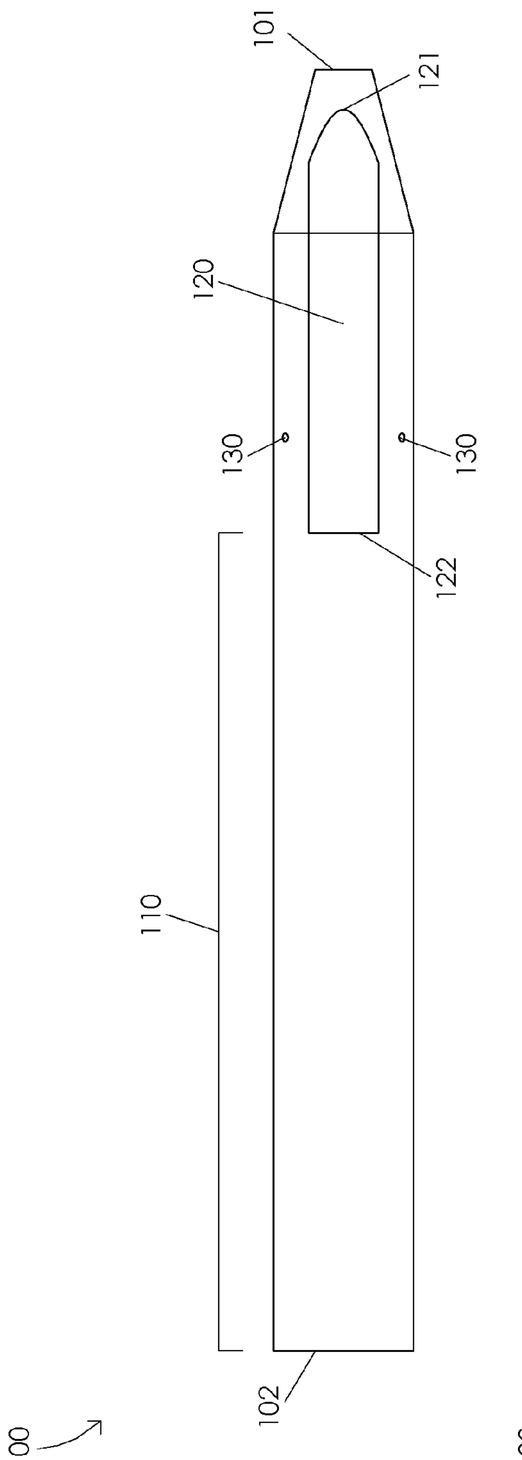
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FIG. 1A

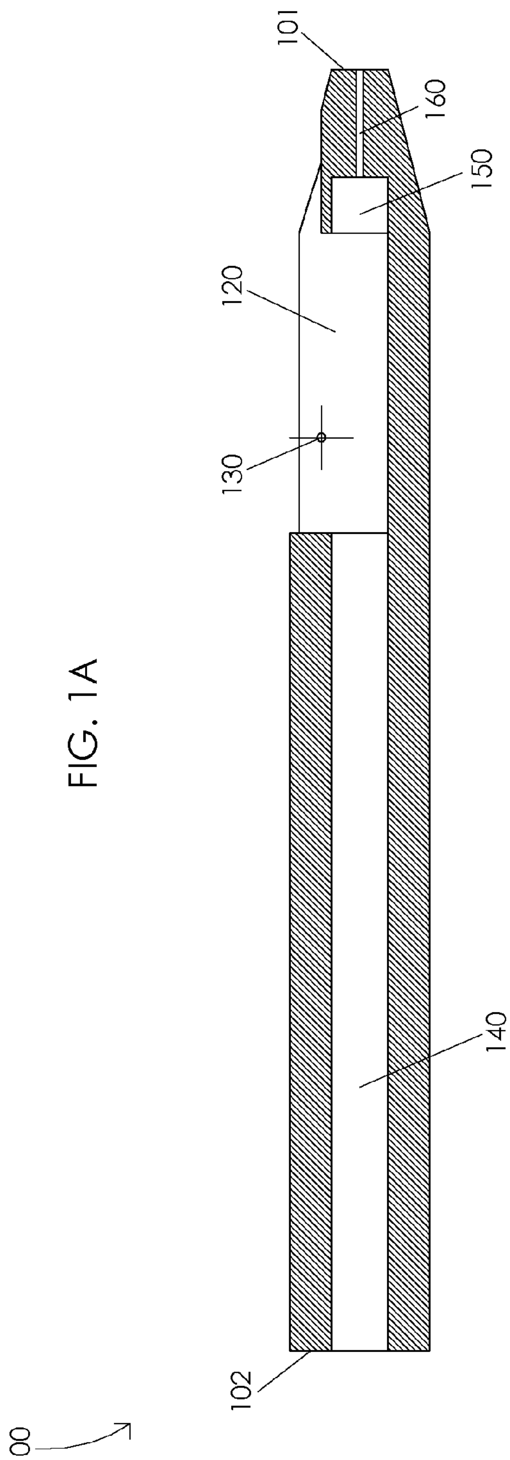
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FIG. 1B

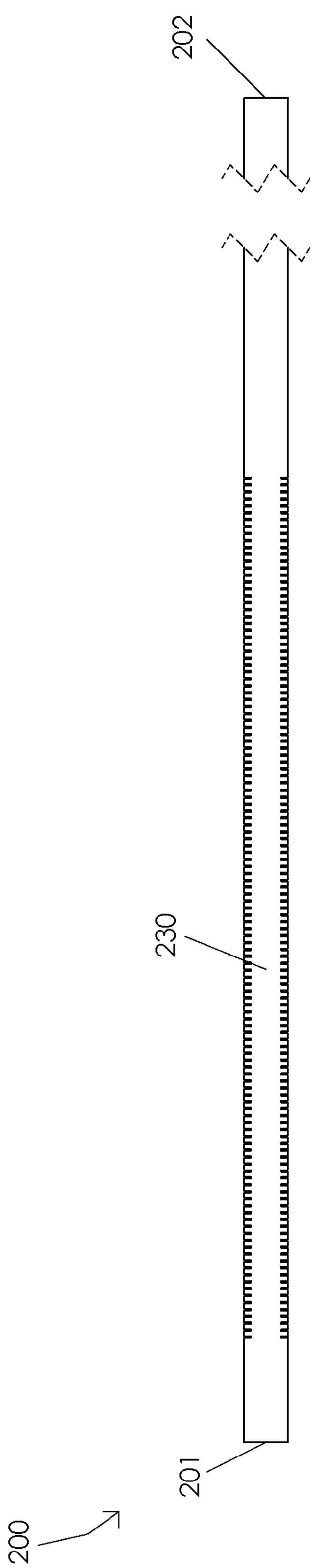

FIG. 2B

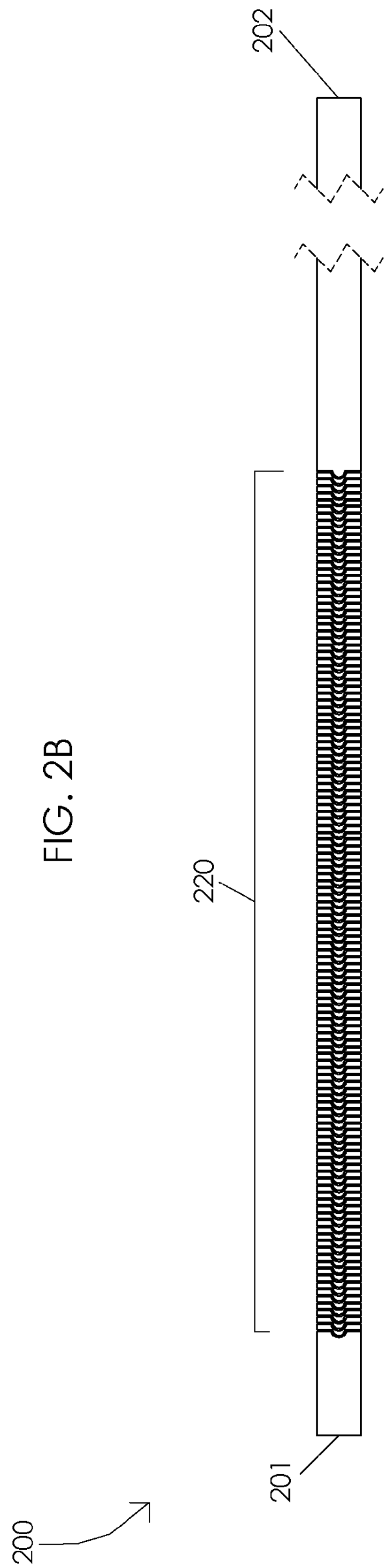

FIG. 2A

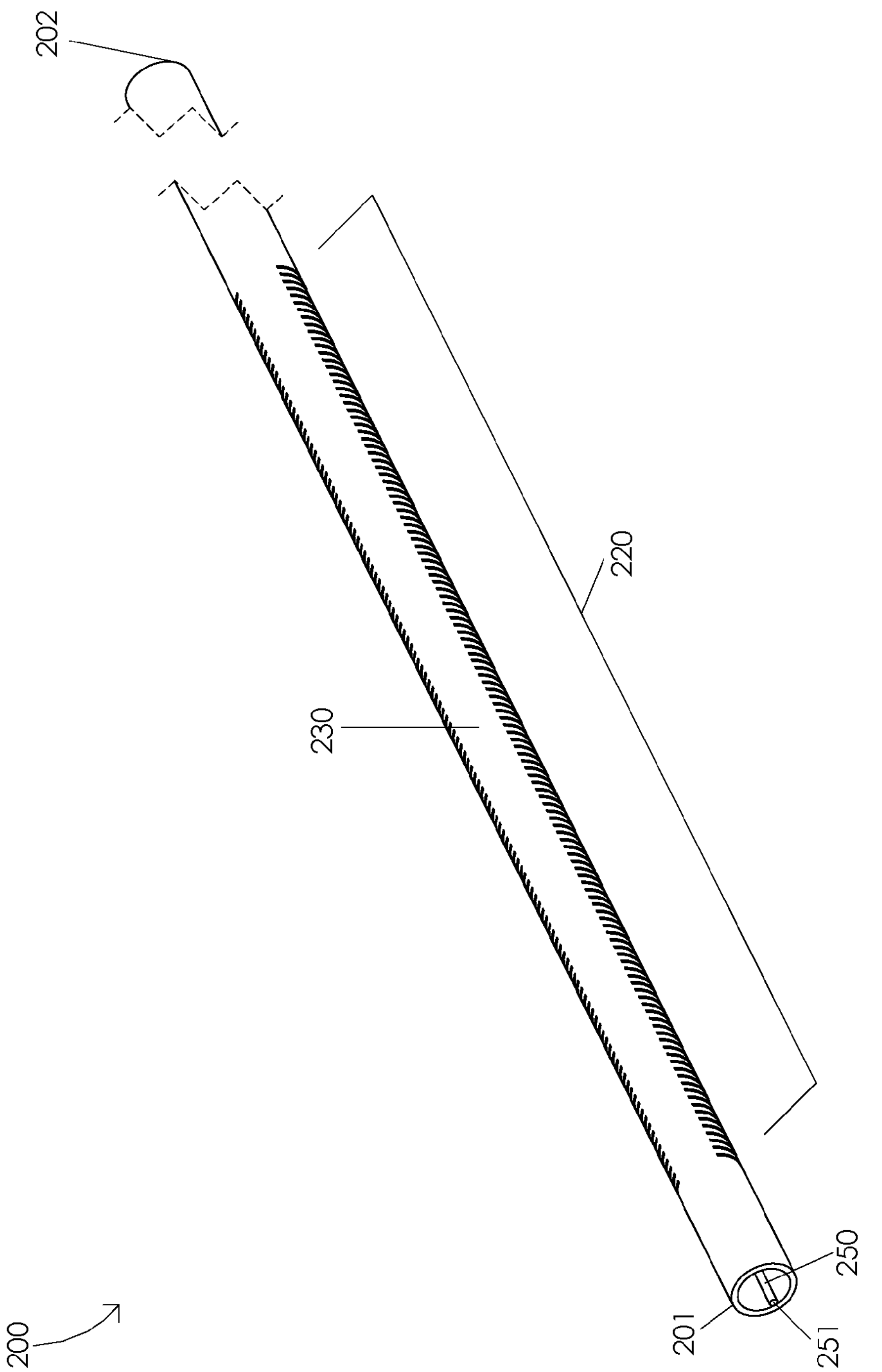

FIG. 2C

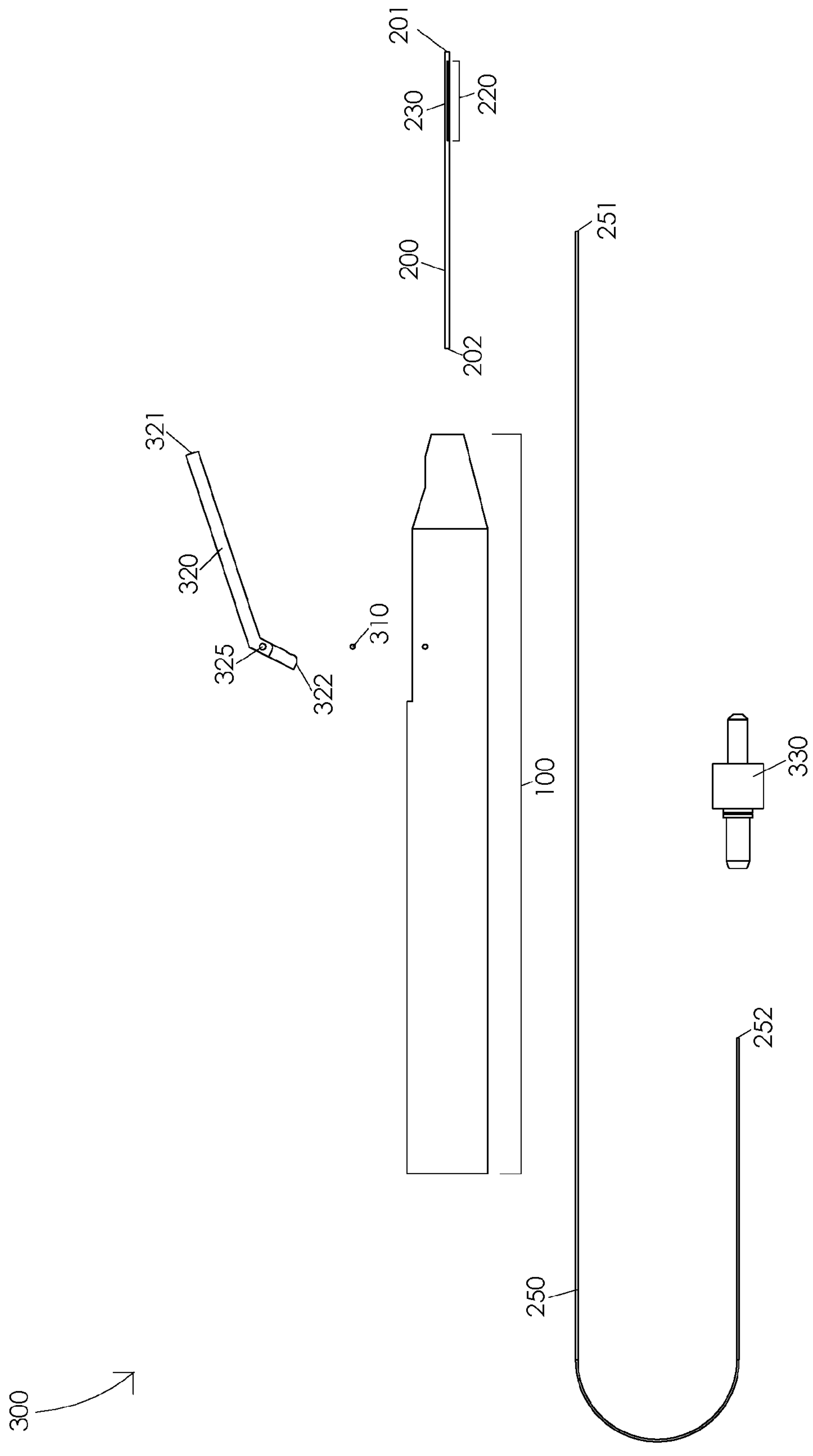

FIG. 3

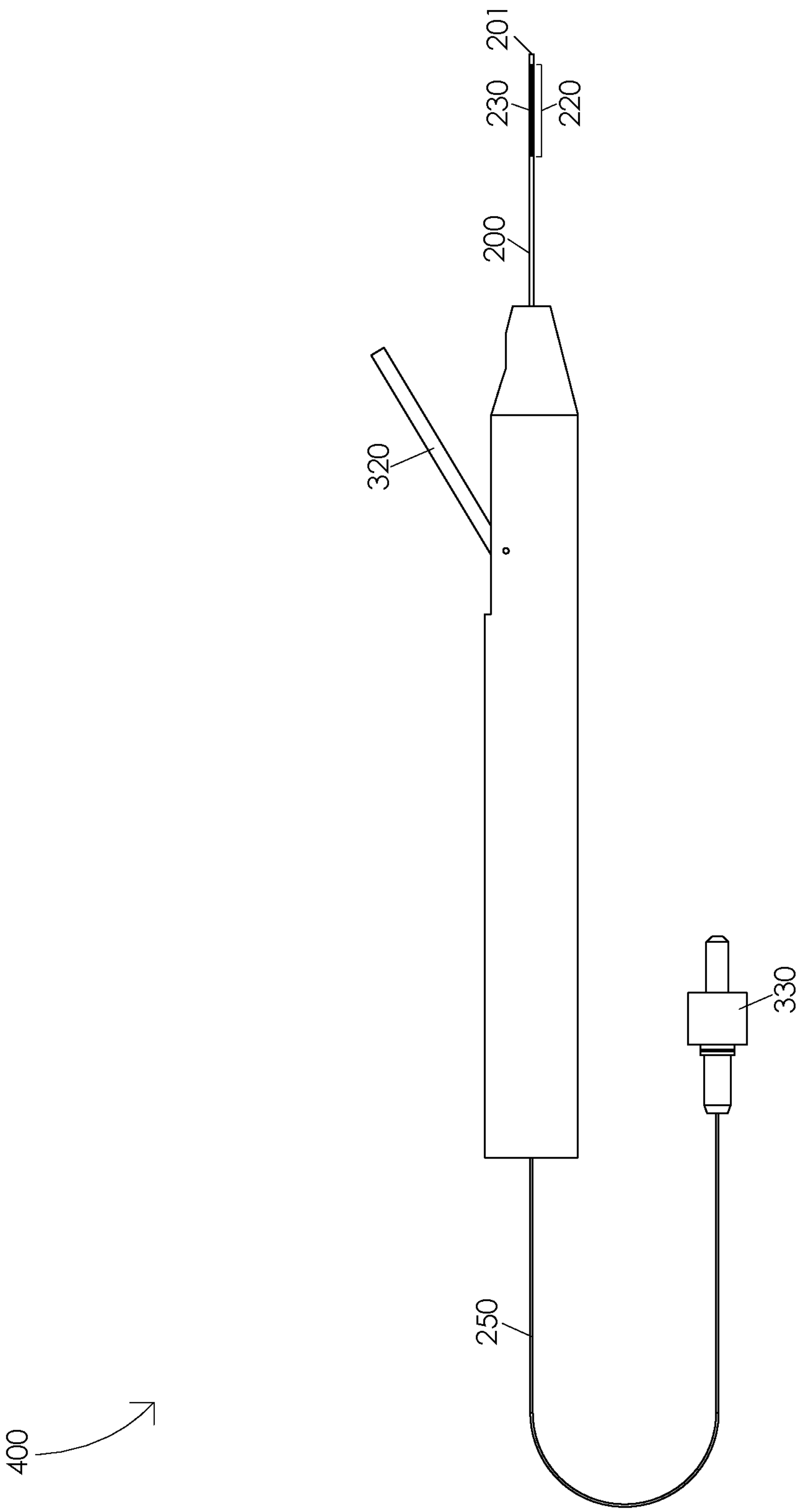

FIG. 4A

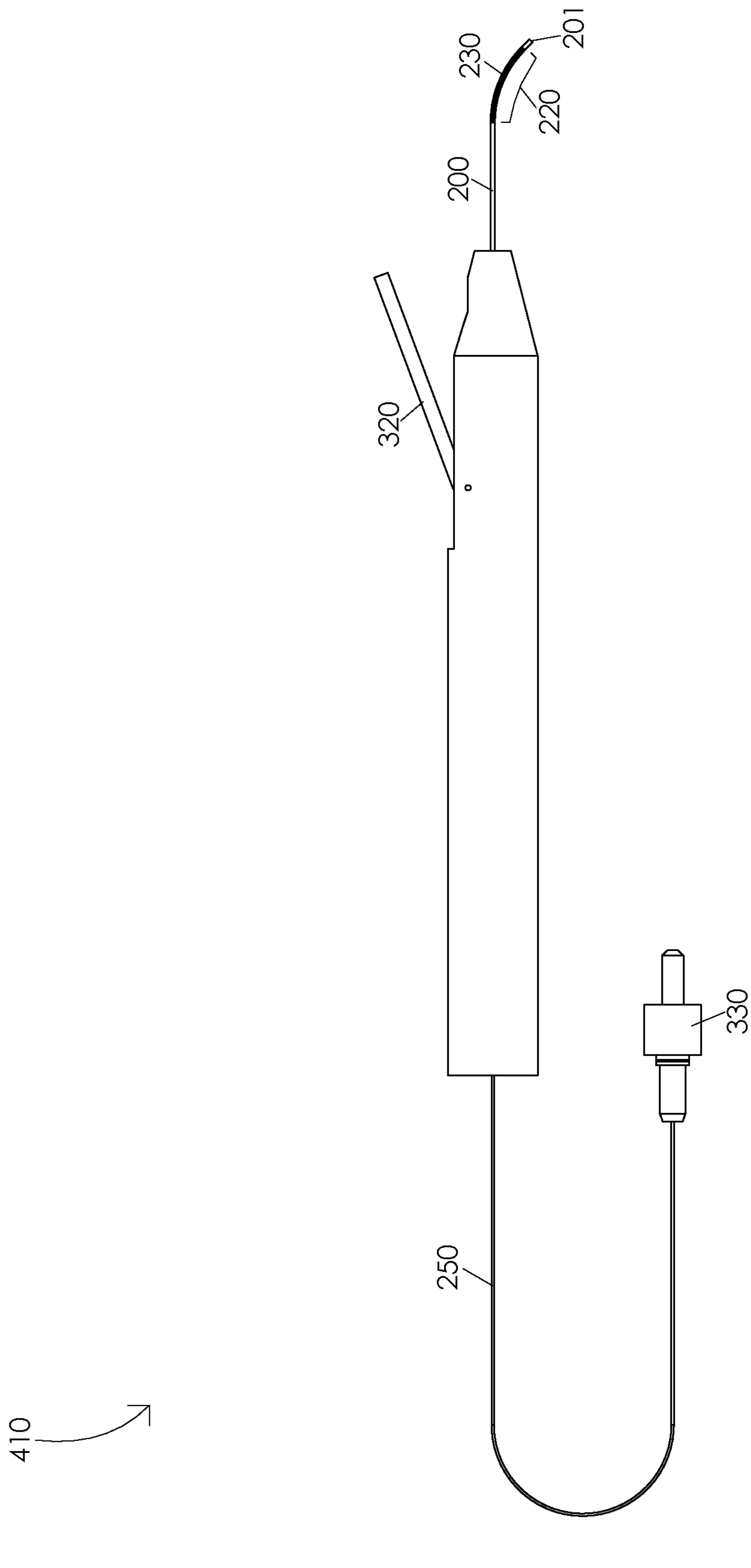

FIG. 4B

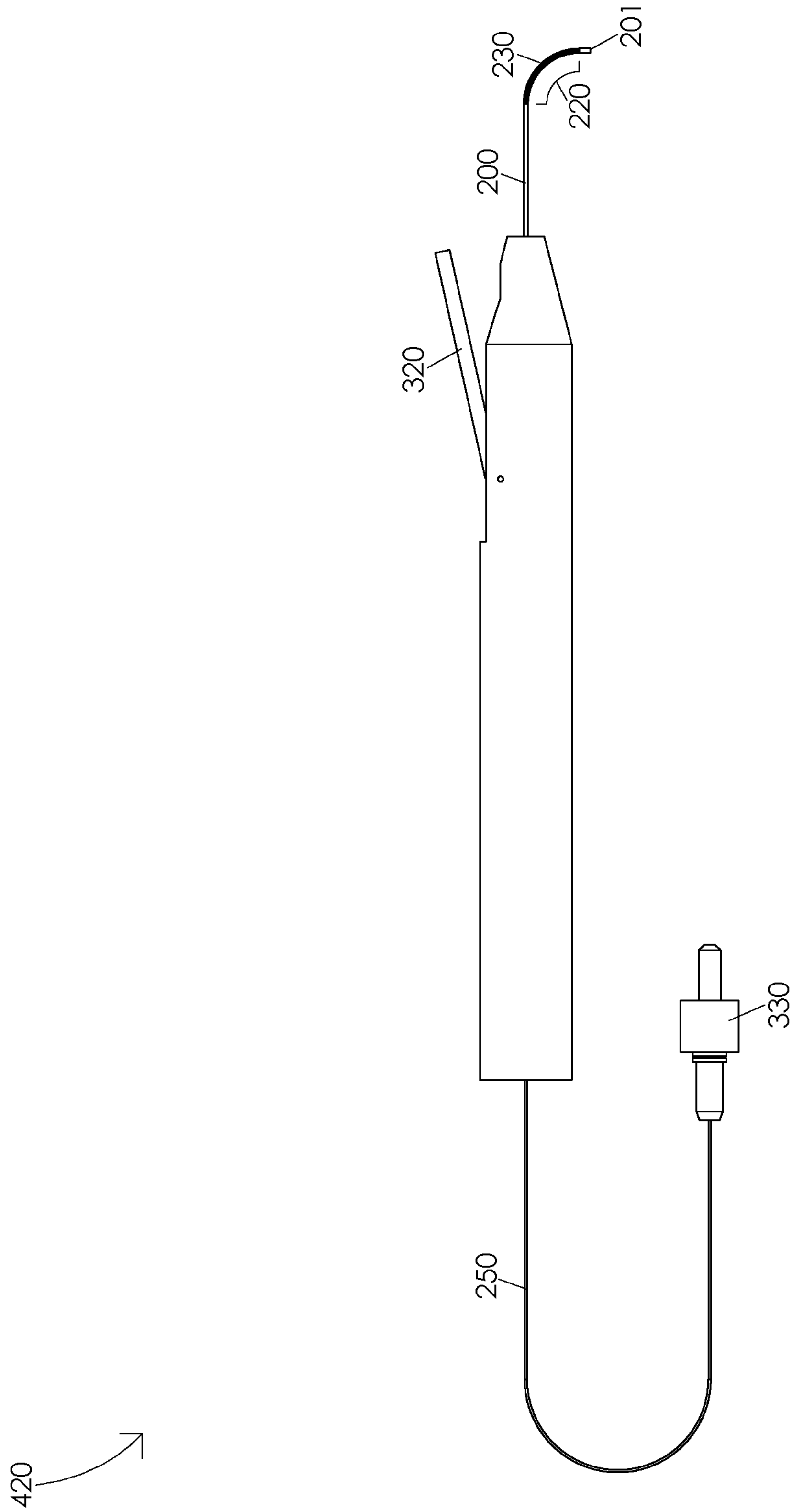

FIG. 4C

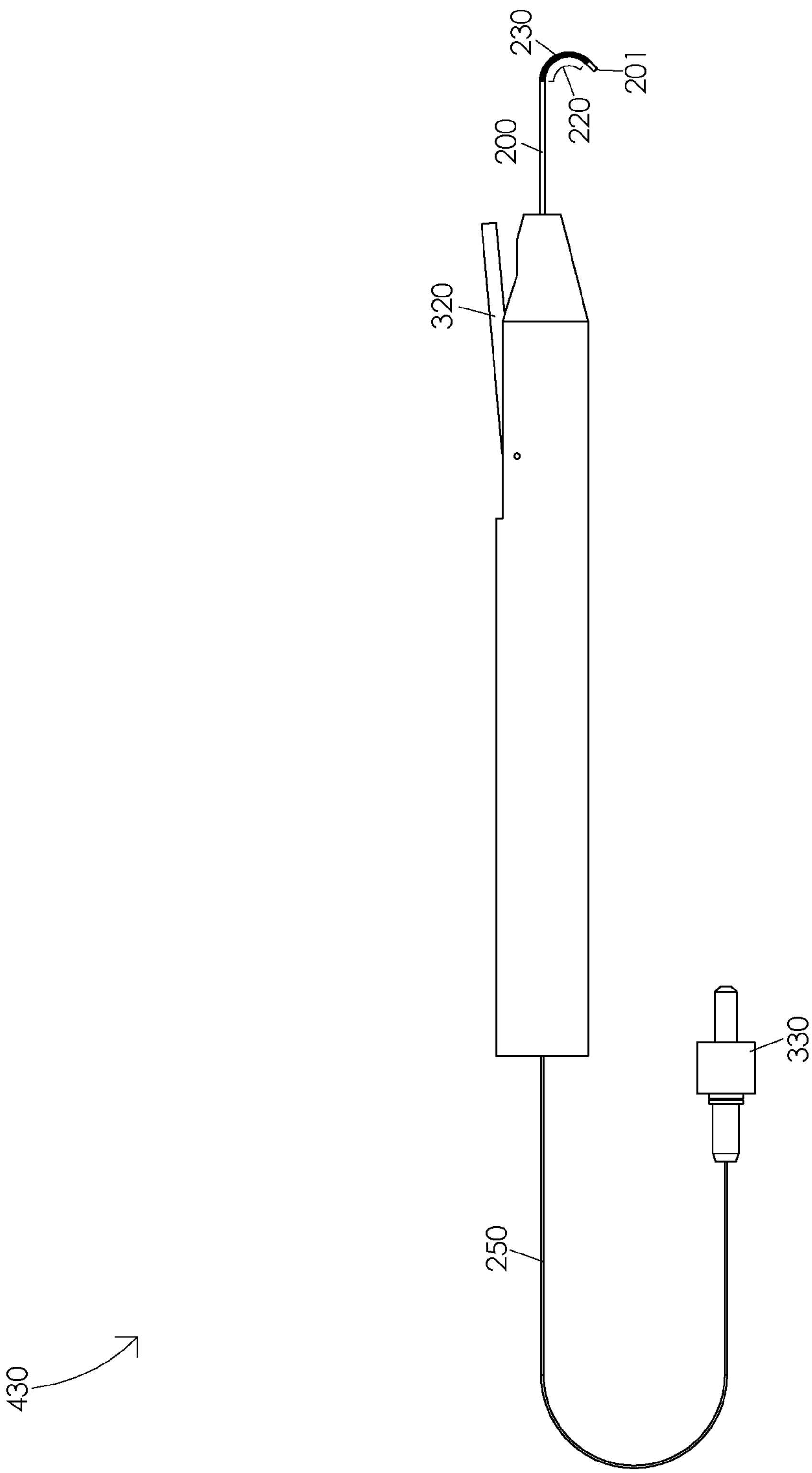

FIG. 4D

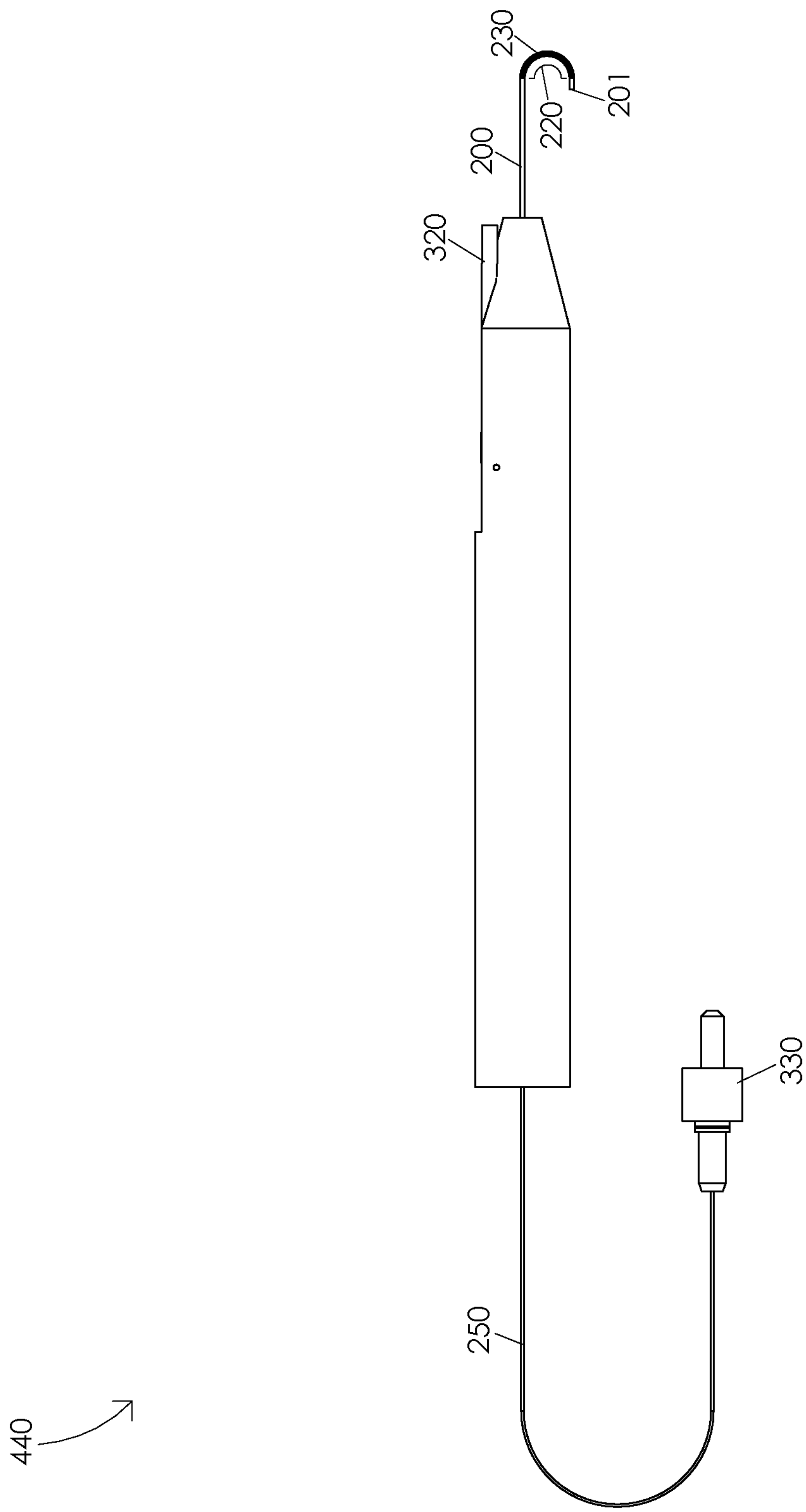

FIG. 4E

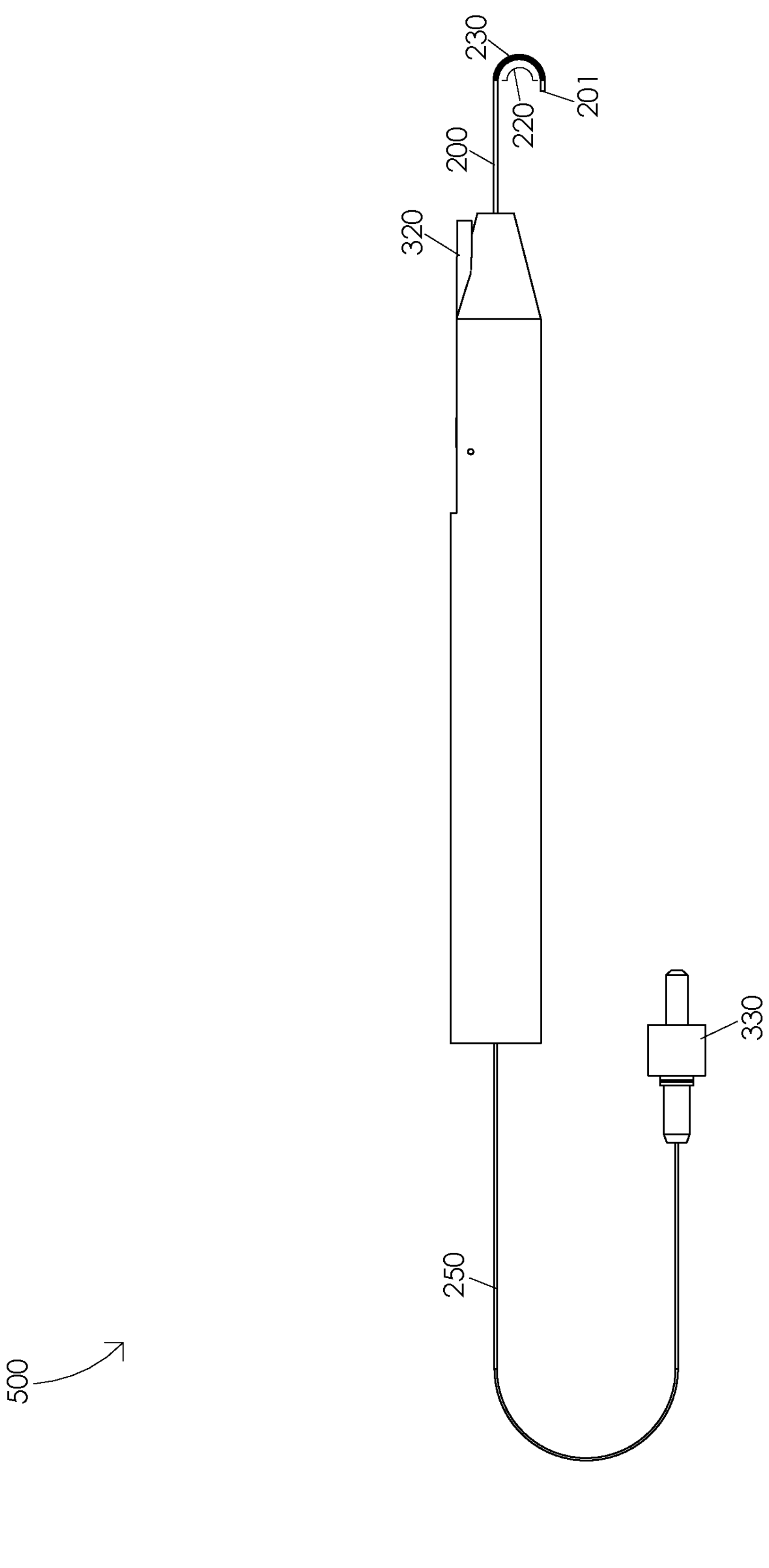

FIG. 5A

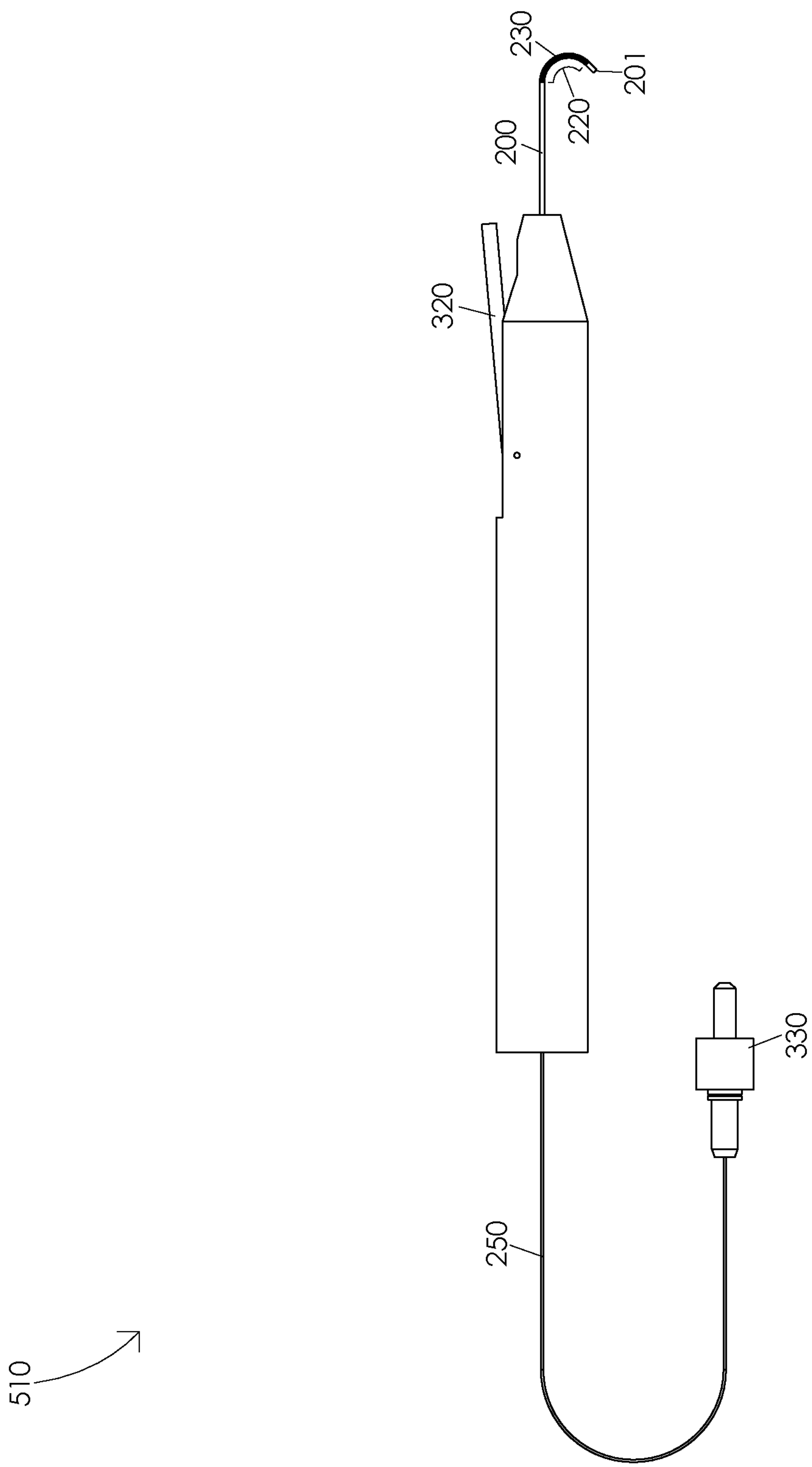

FIG. 5B

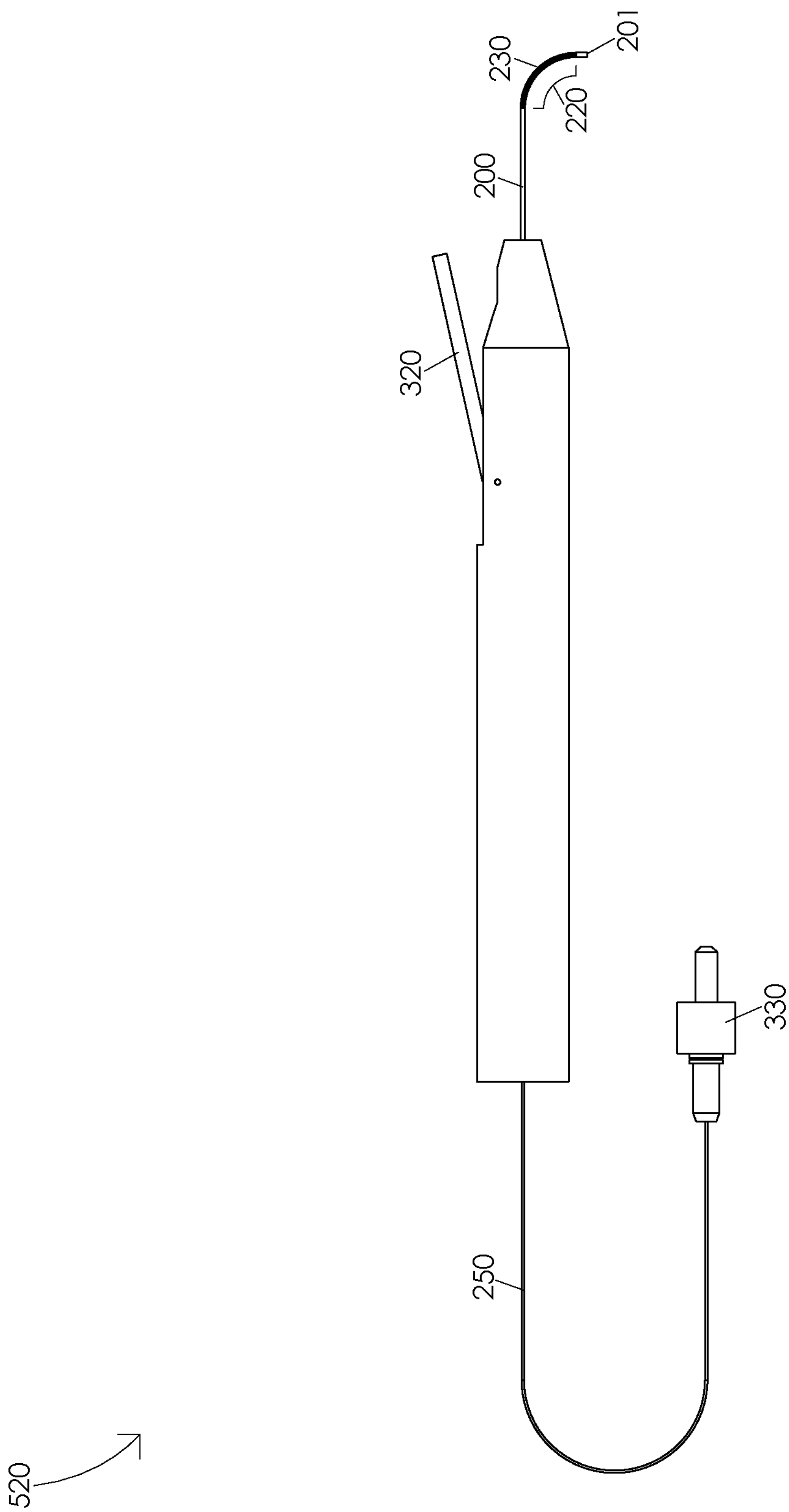

FIG. 5C

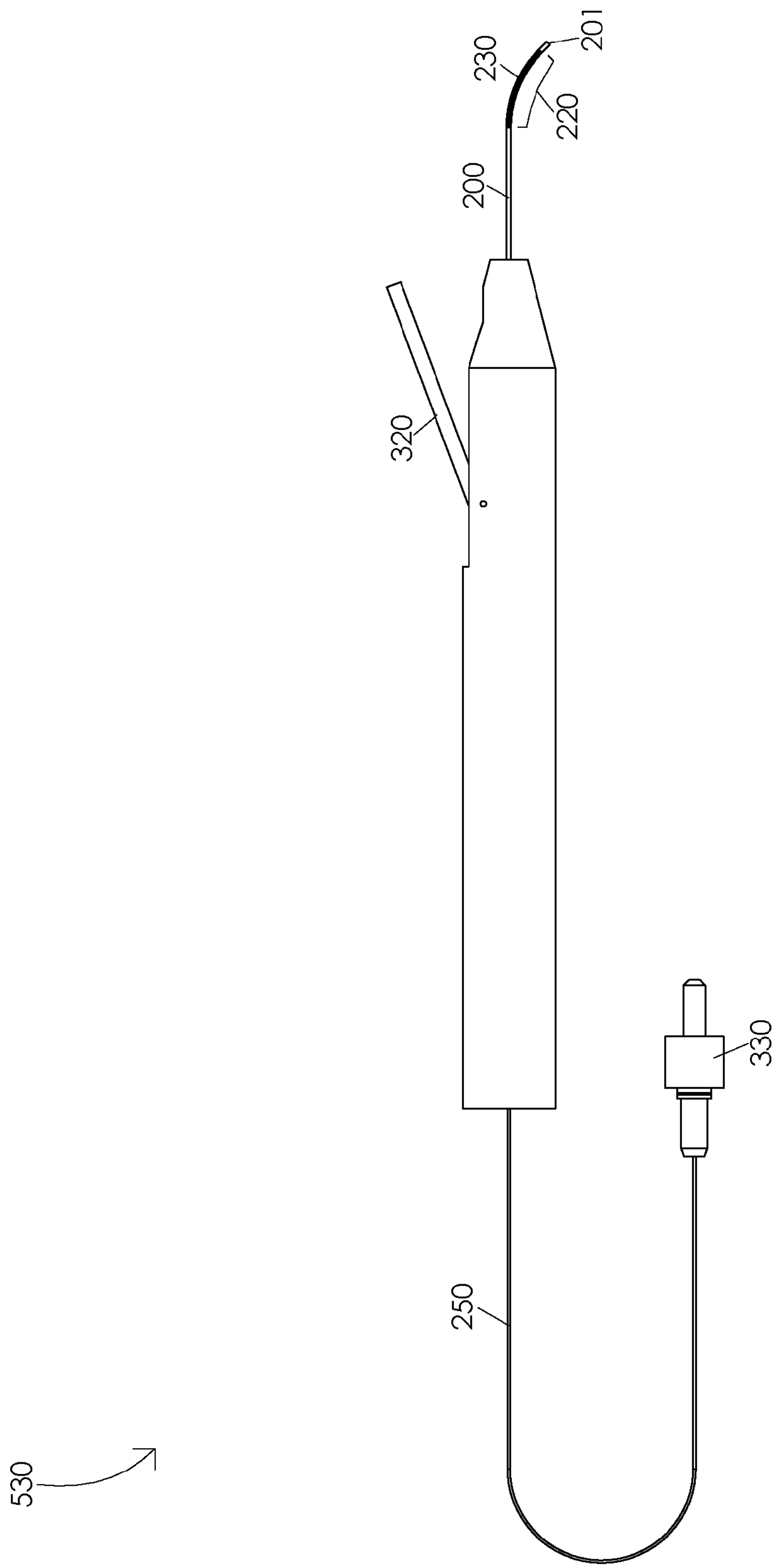

FIG. 5D

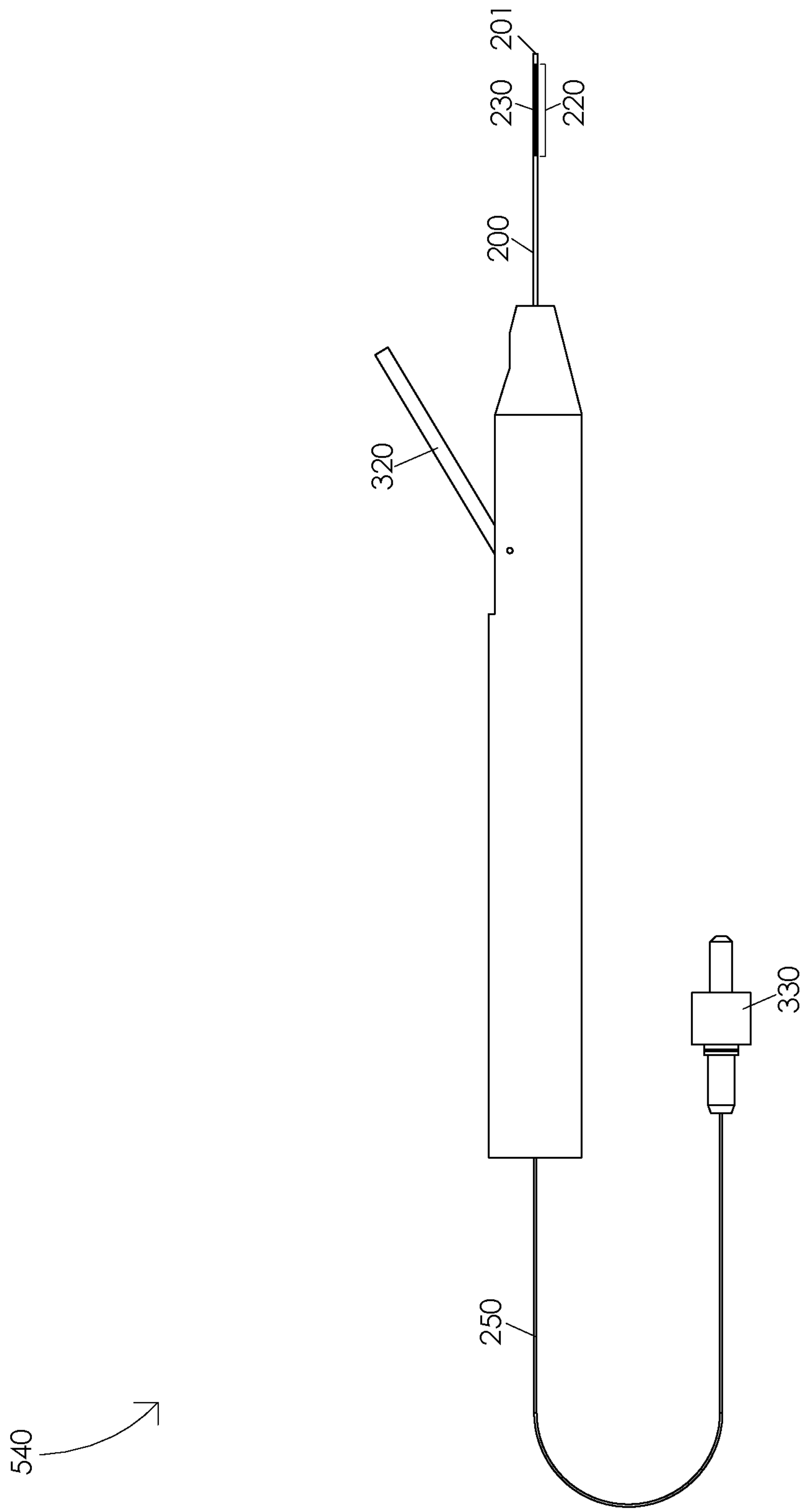

FIG. 5E

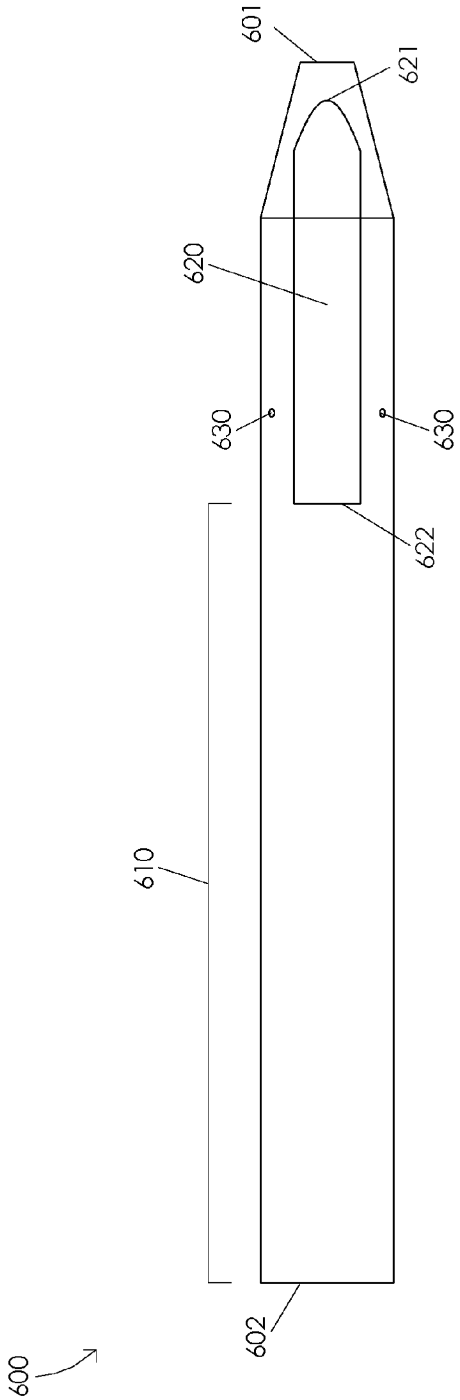
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FIG. 6A

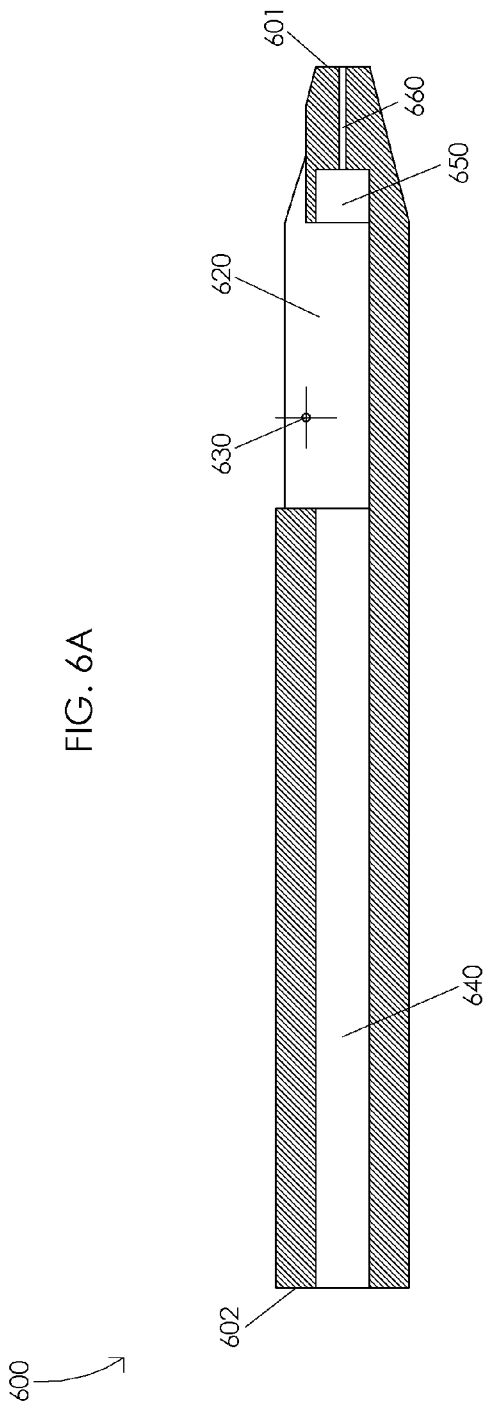
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FIG. 6B

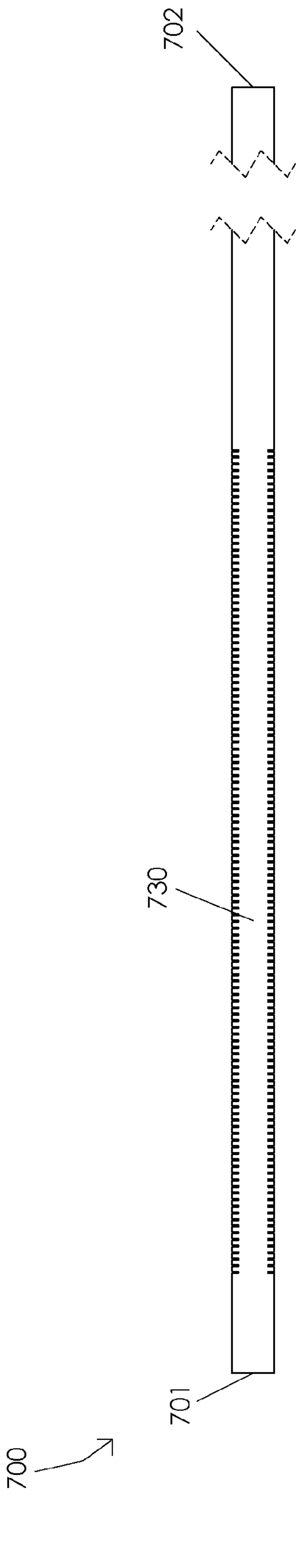

FIG. 7B

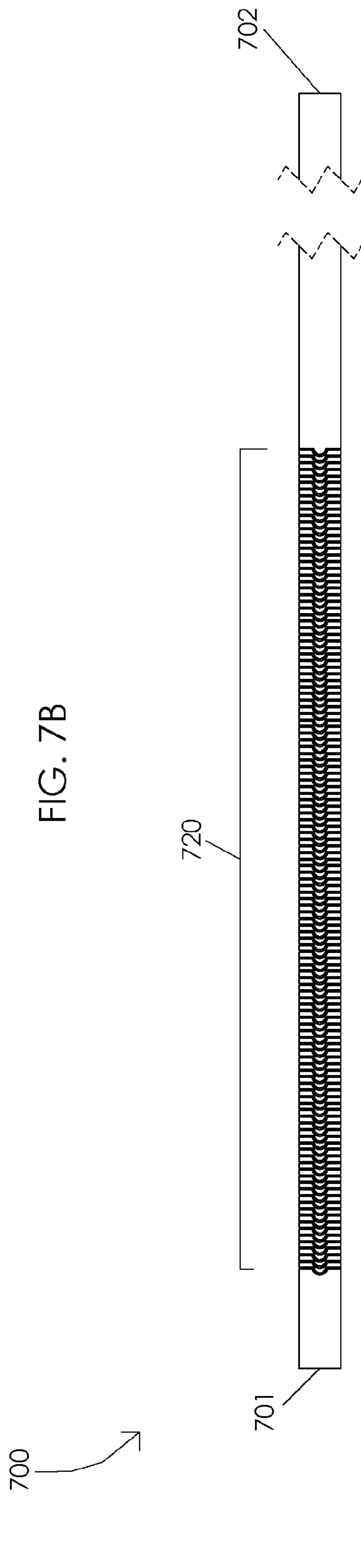

FIG. 7A

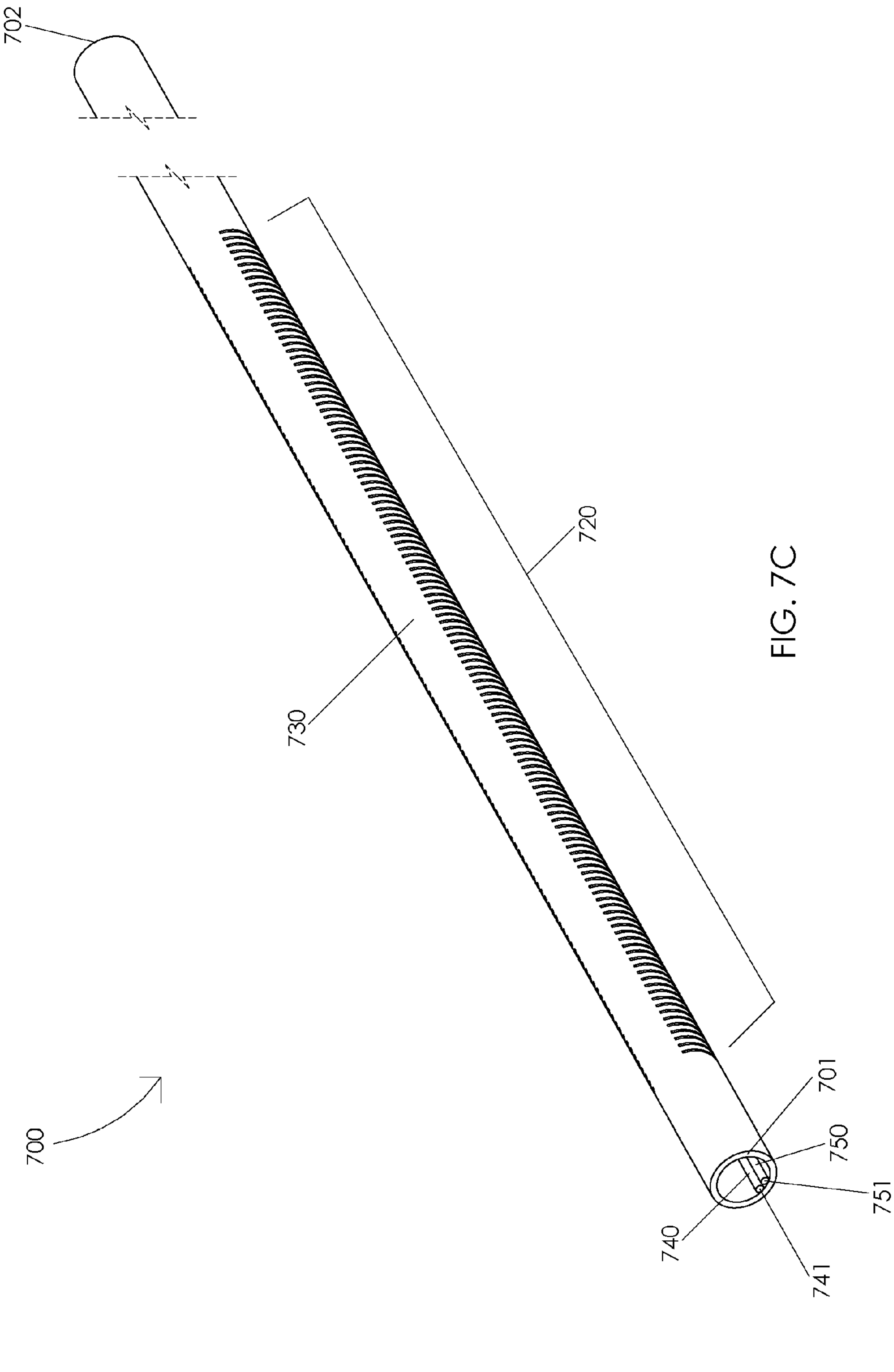

FIG. 7C

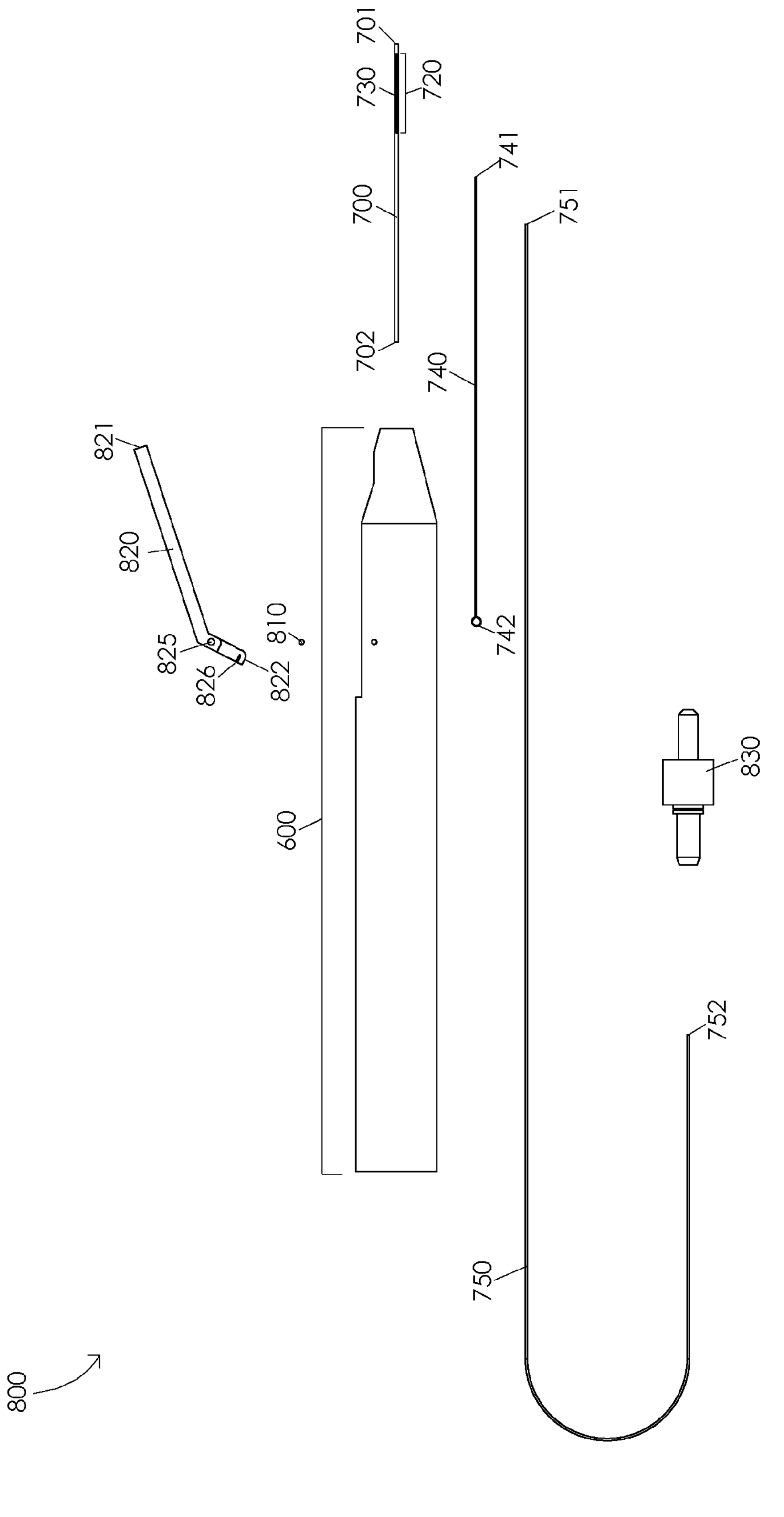
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FIG. 8

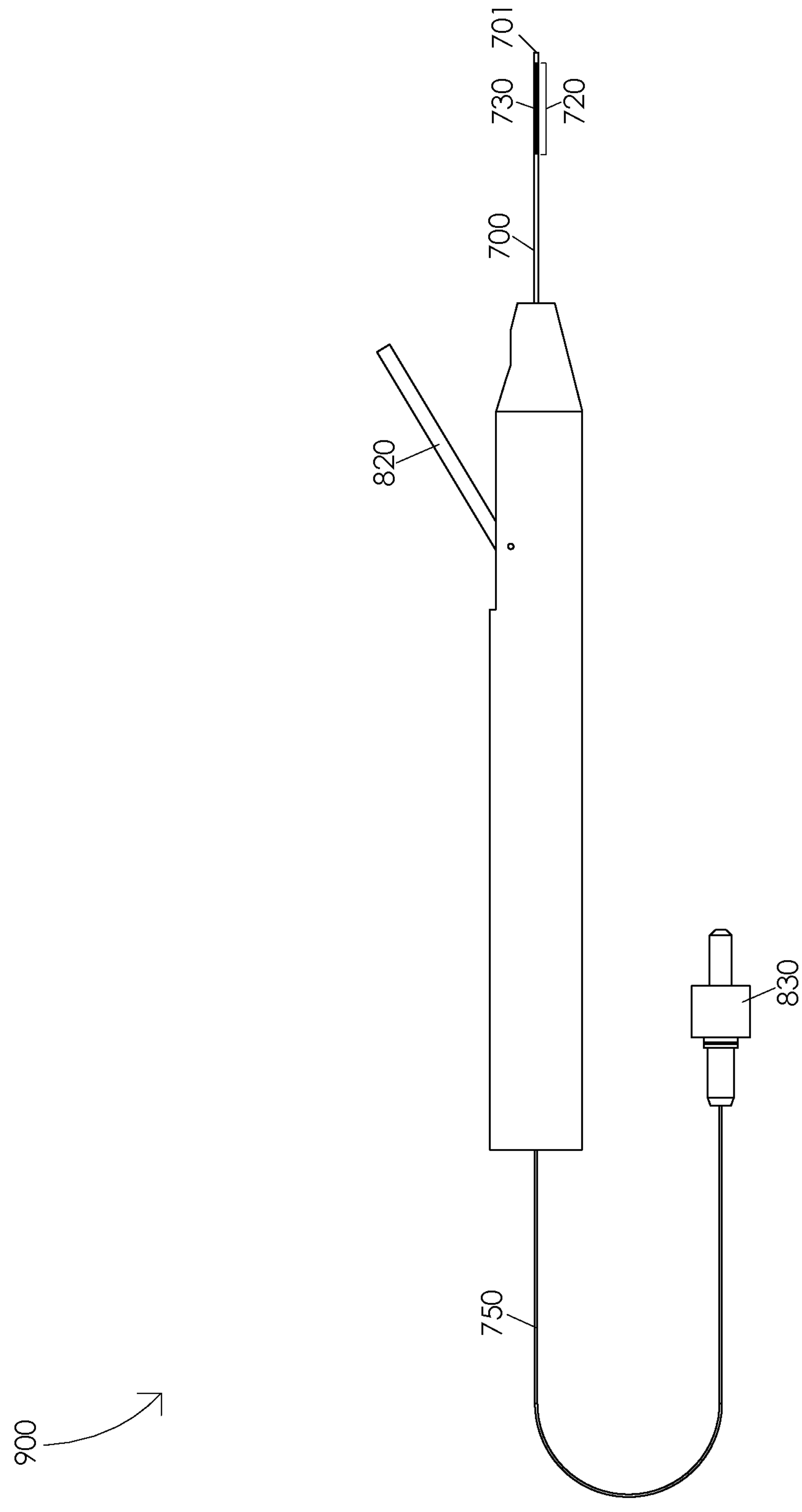

FIG. 9A

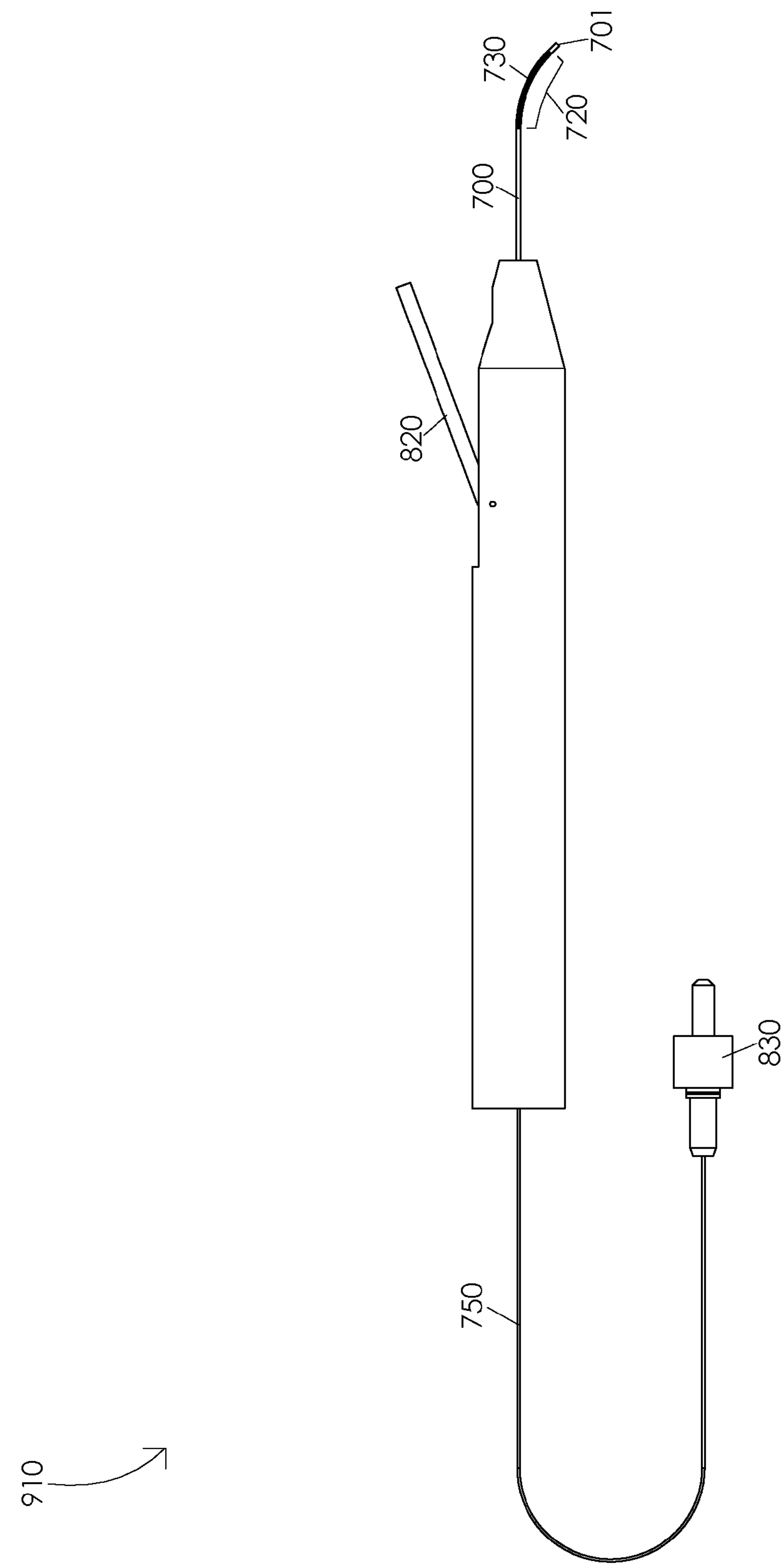

FIG. 9B

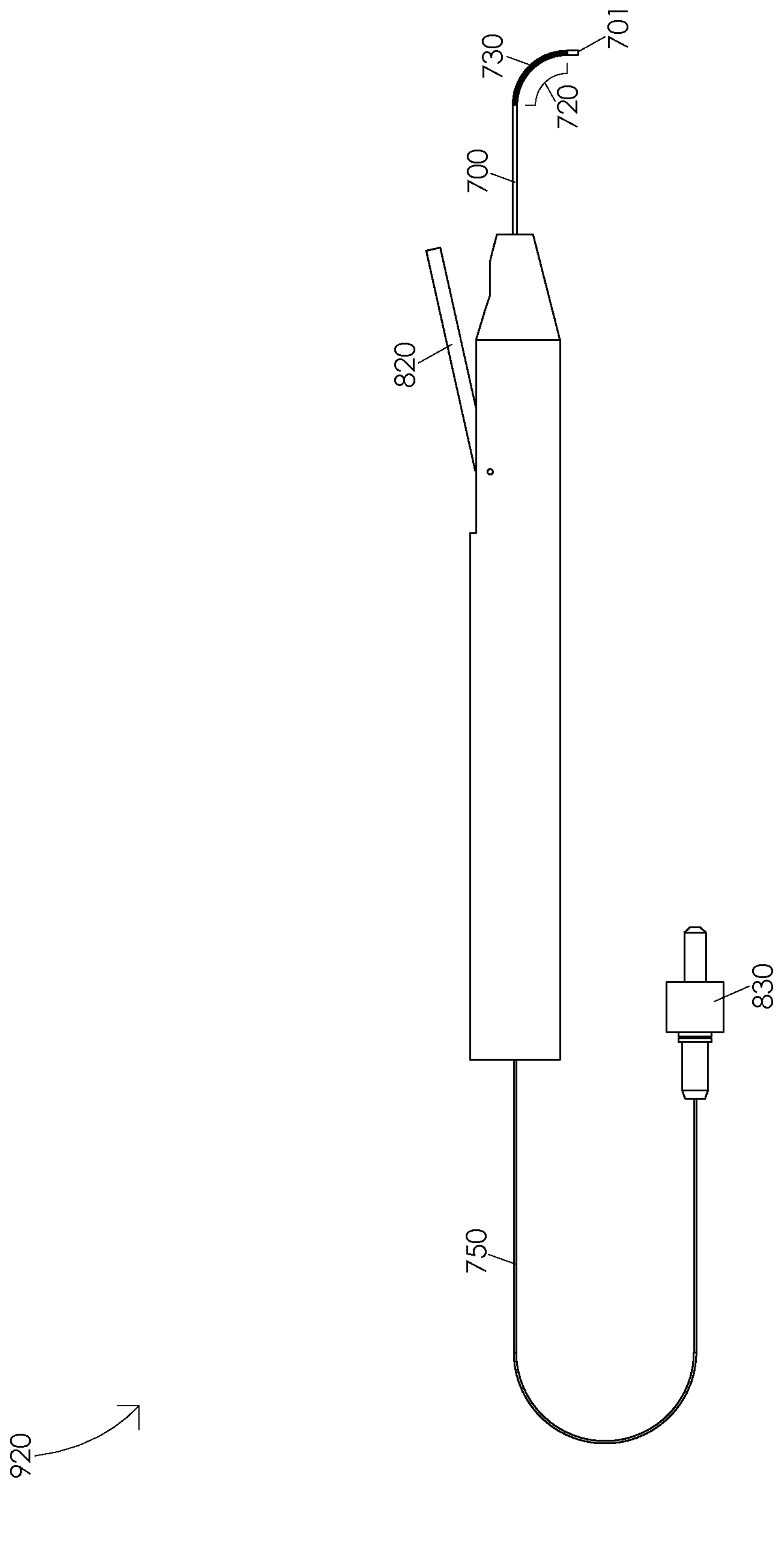

FIG. 9C

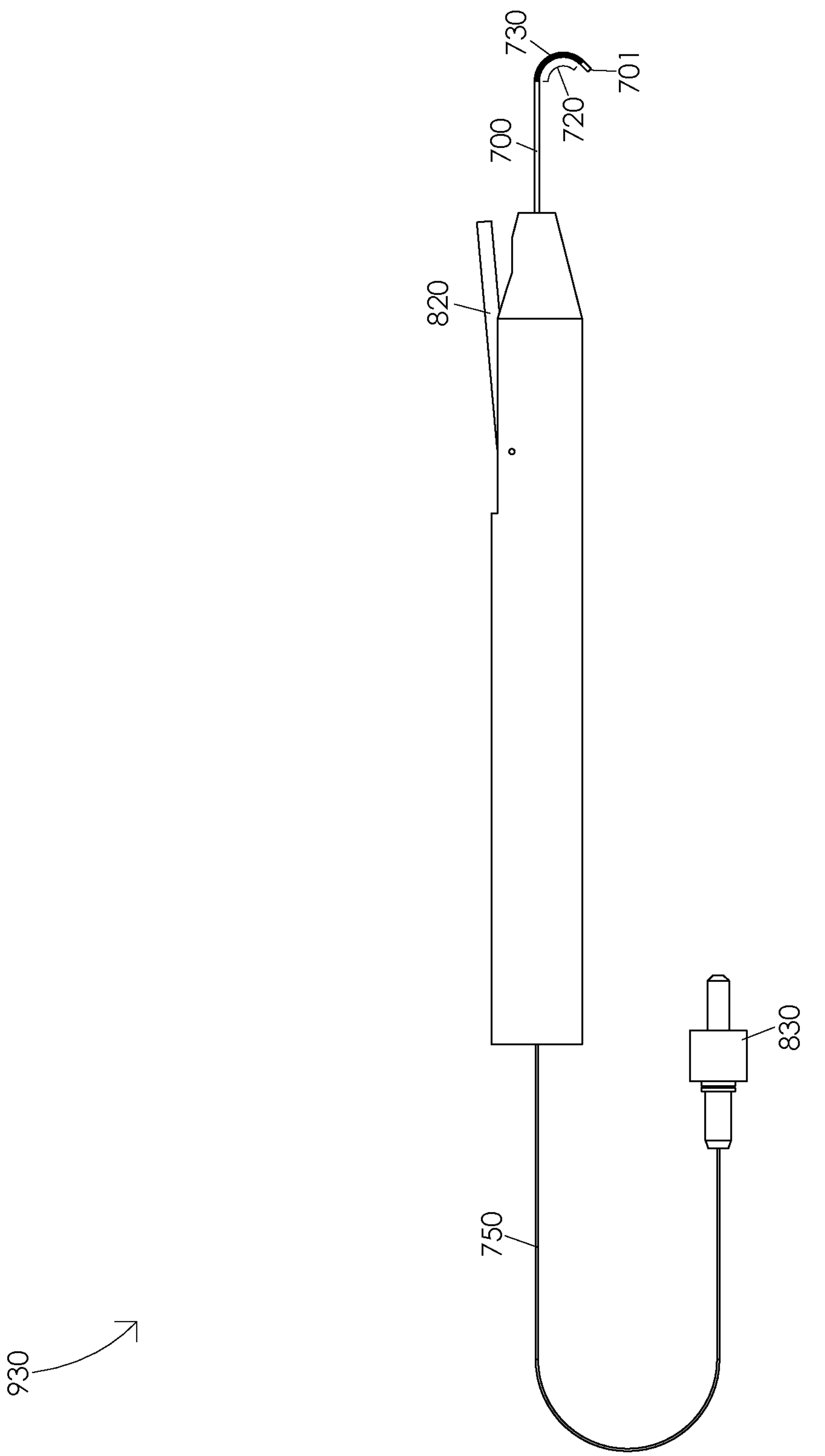

FIG. 9D

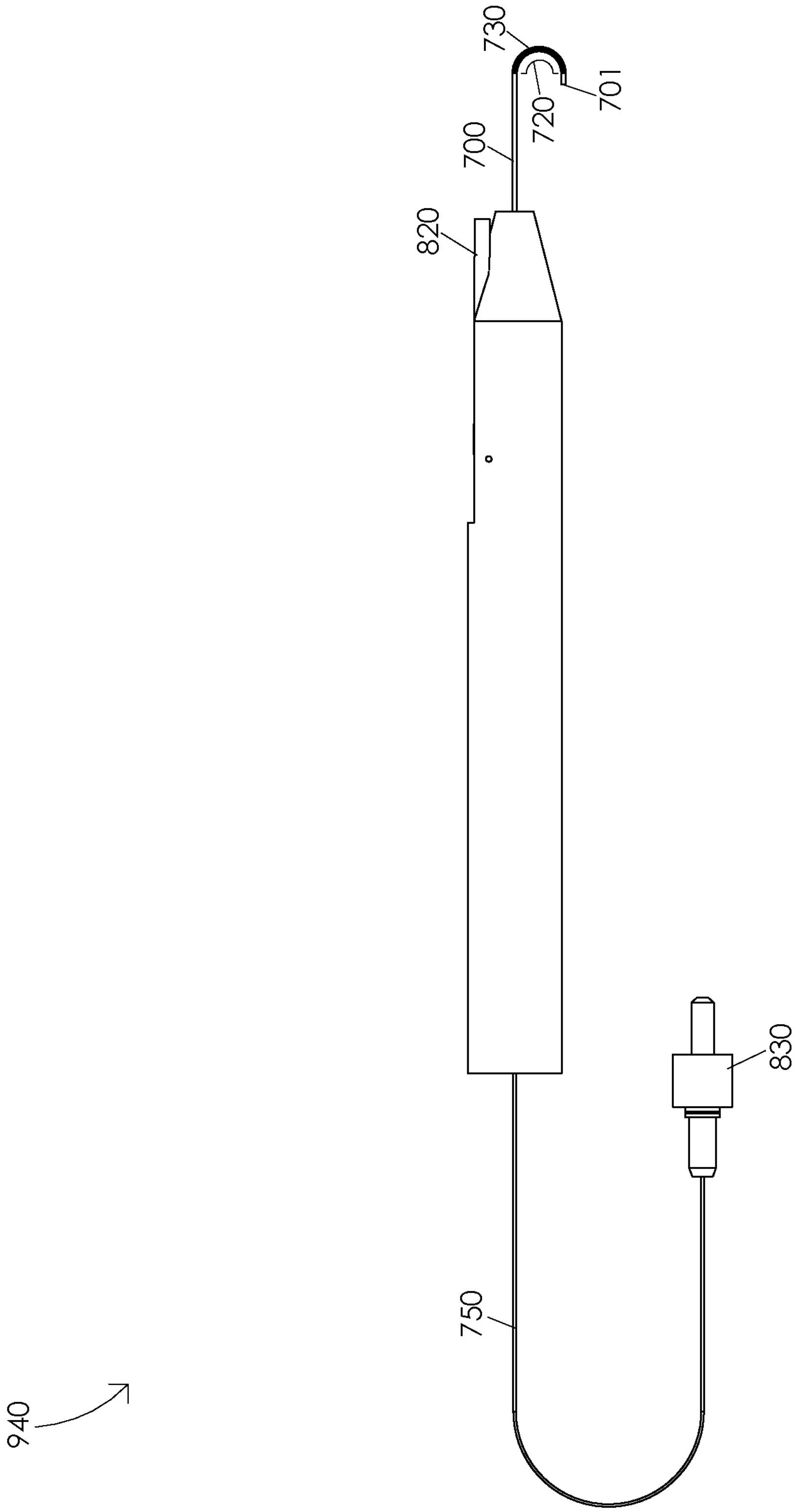

FIG. 9E

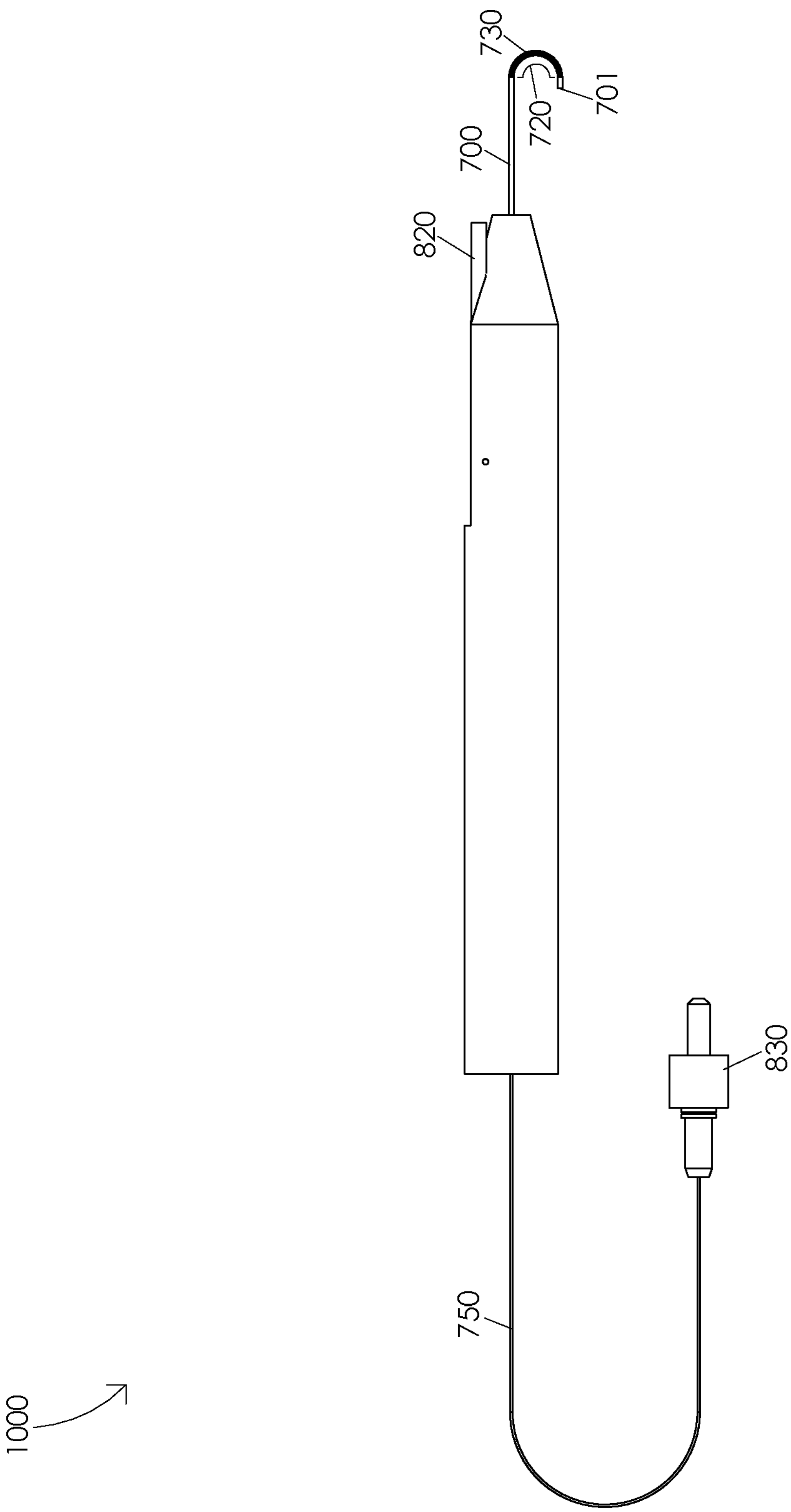

FIG. 10A

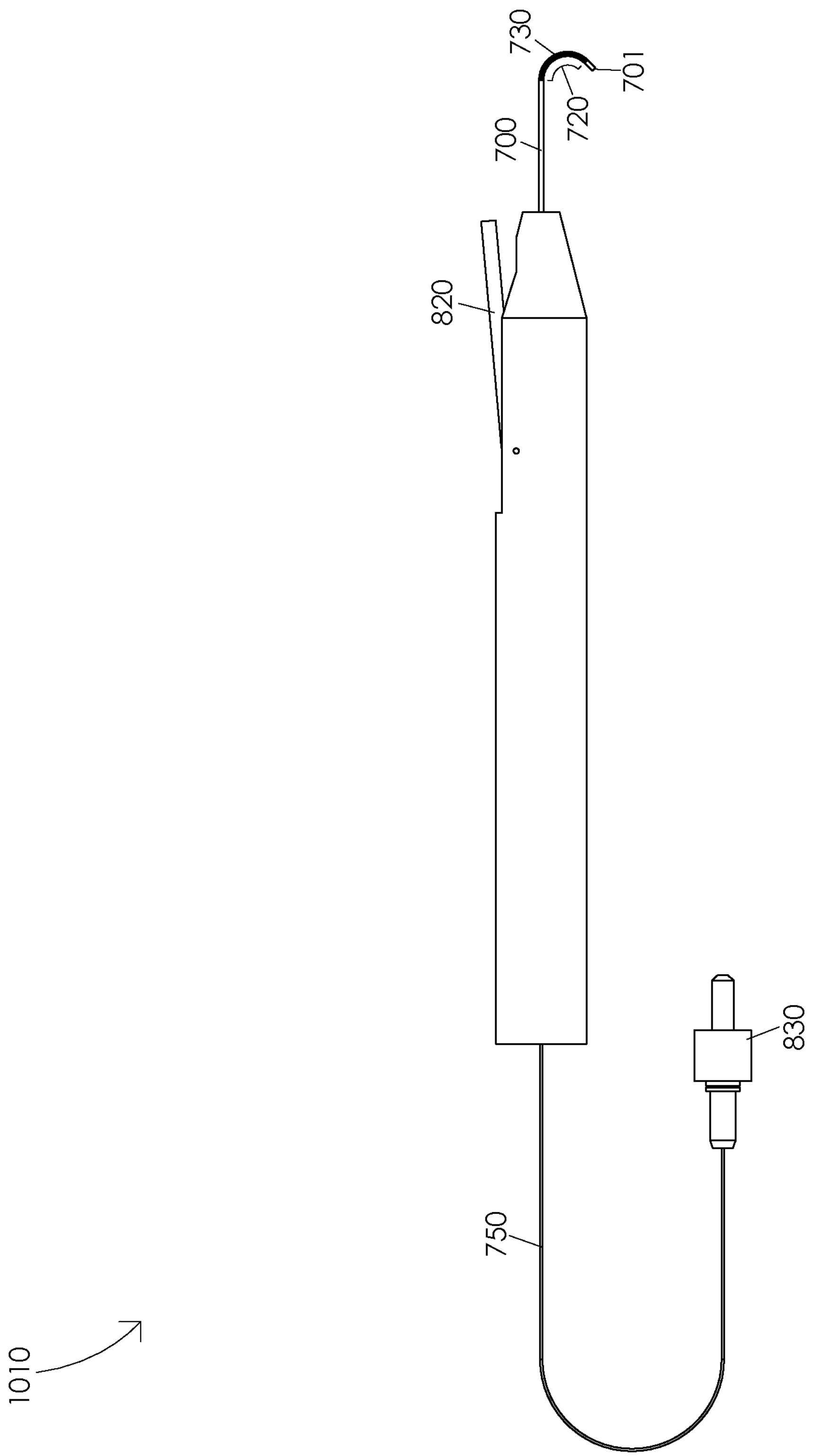

FIG. 10B

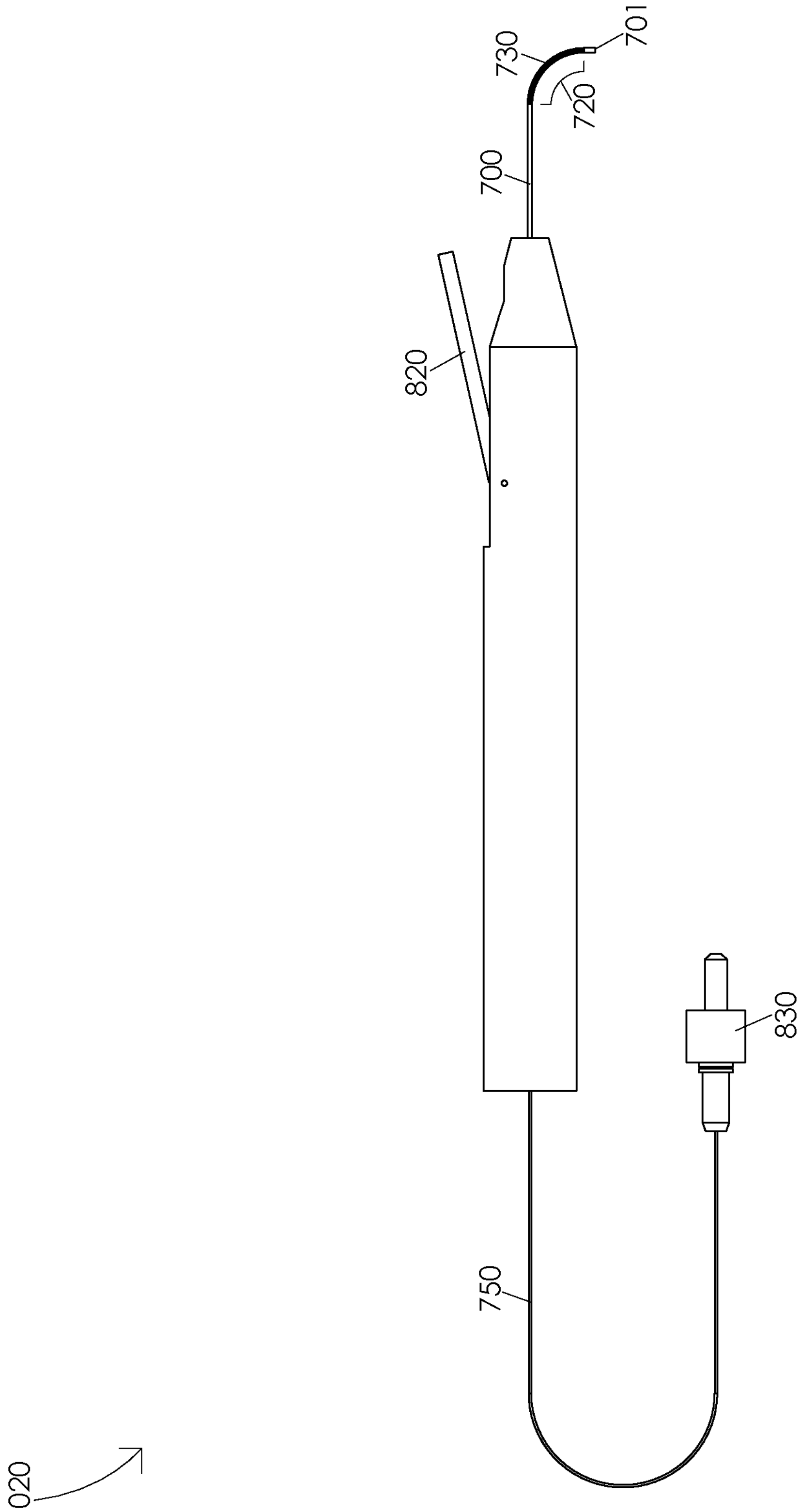

FIG. 10C

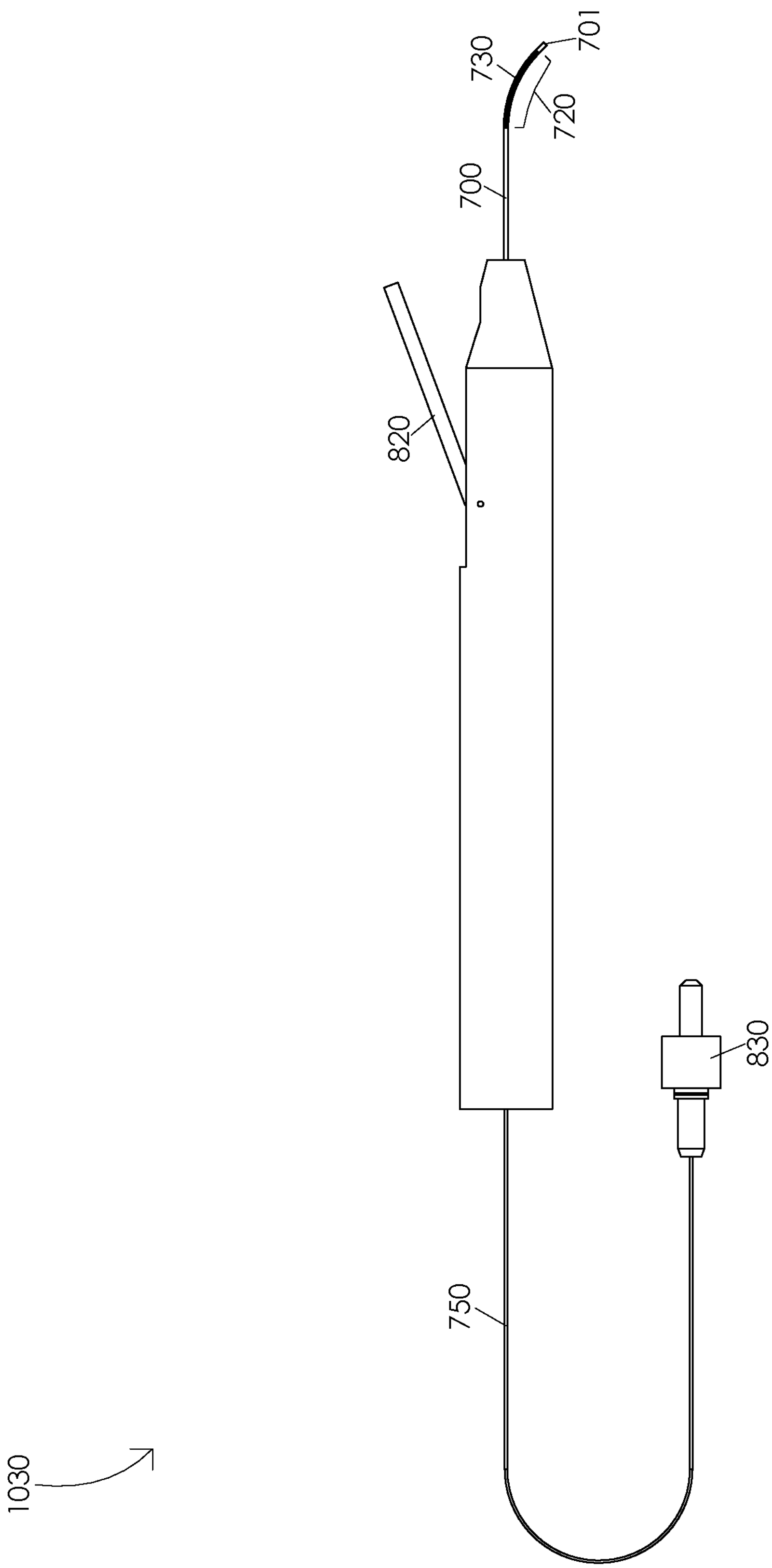

FIG. 10D

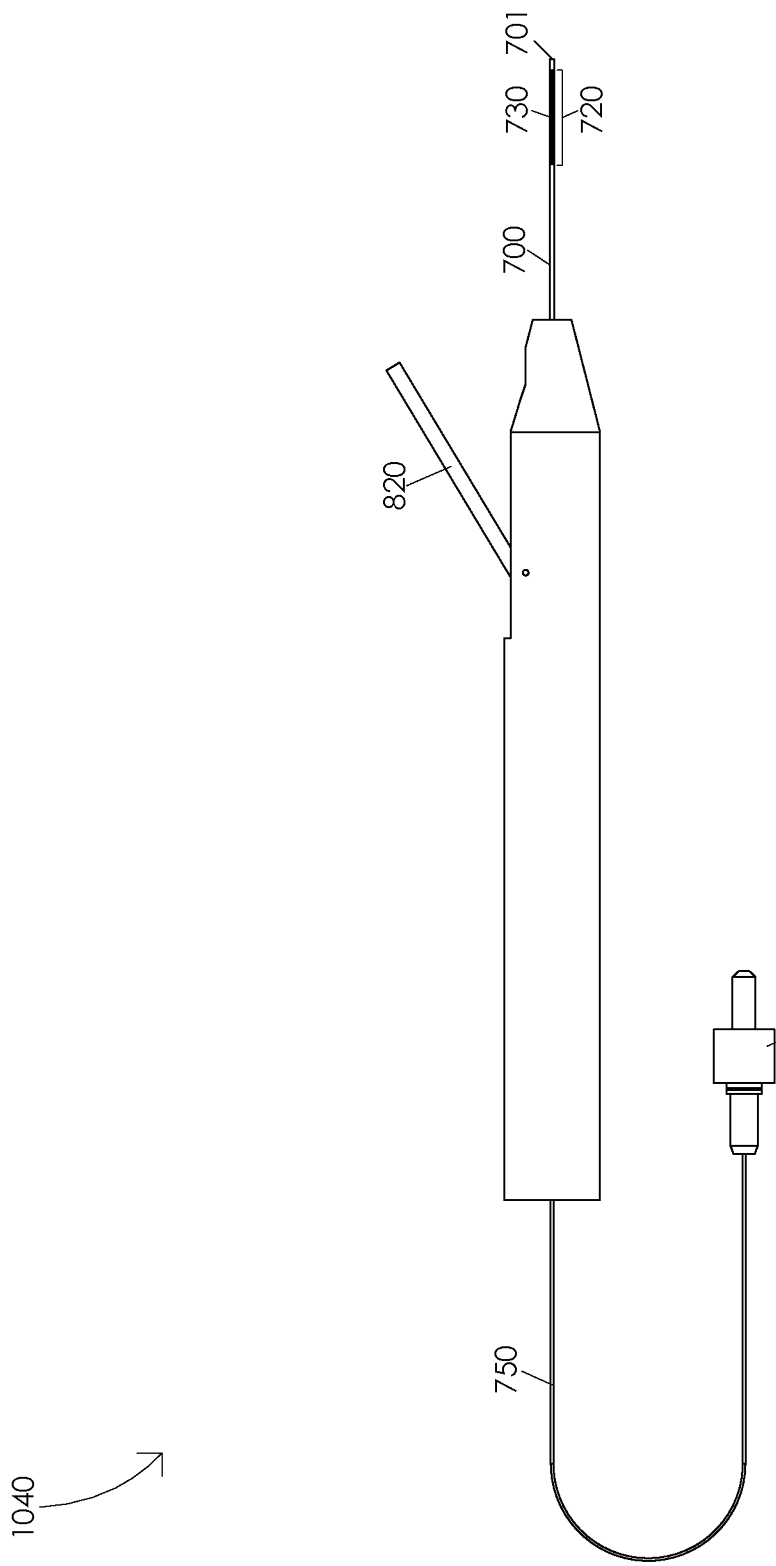

FIG. 10E

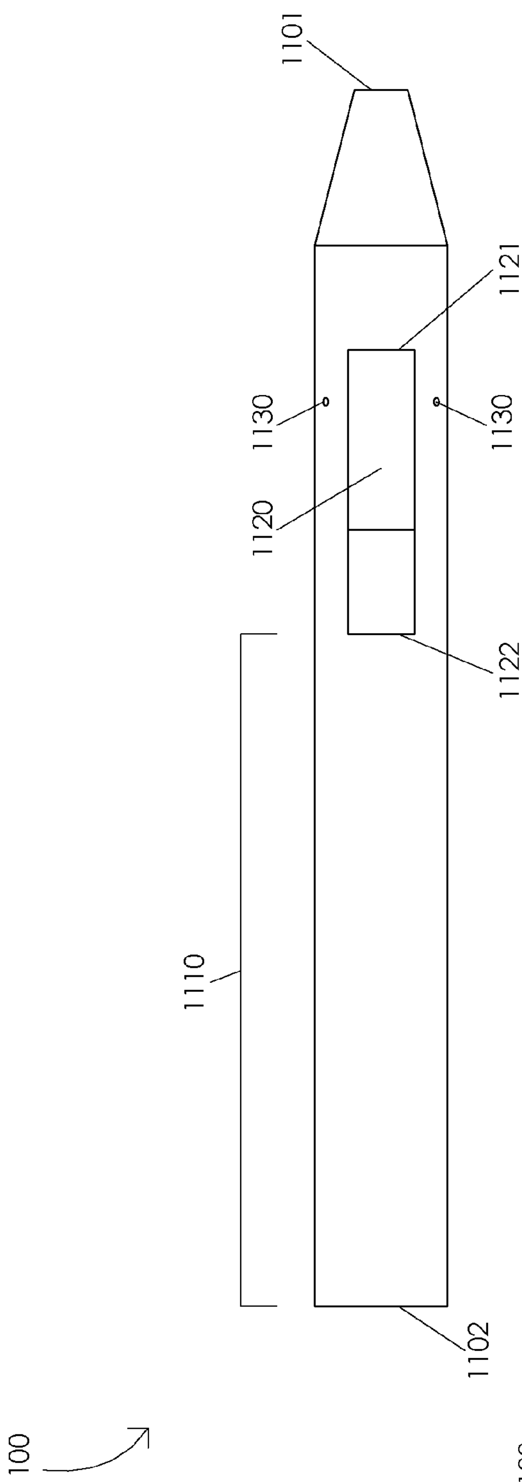

FIG. 11A

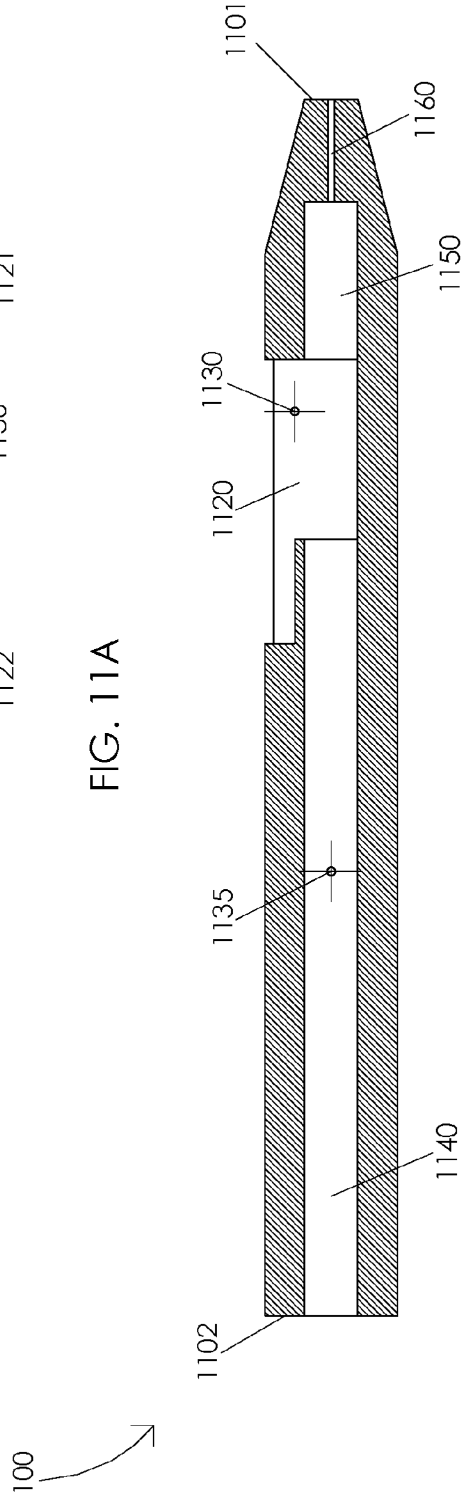

FIG. 11B

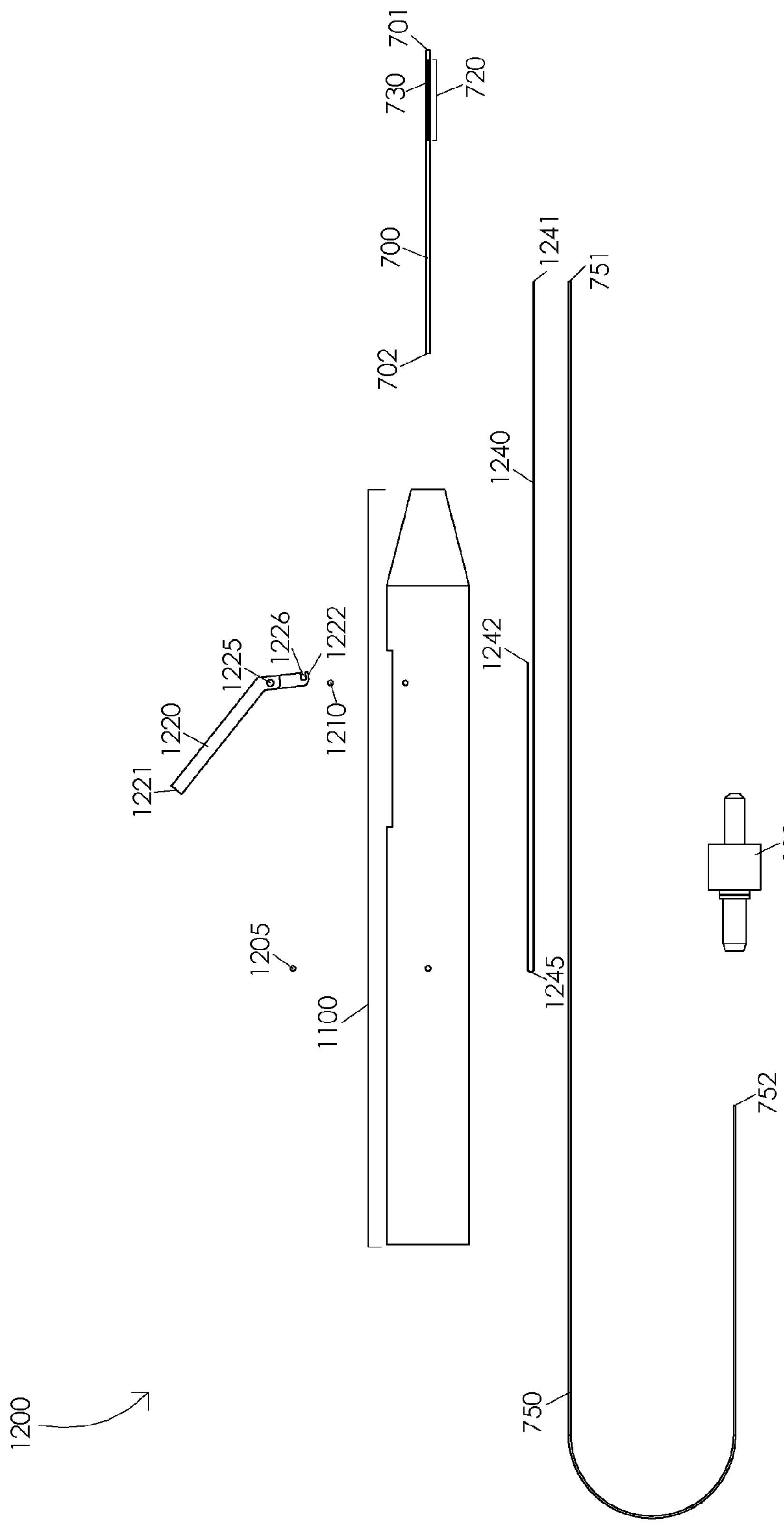
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FIG. 12

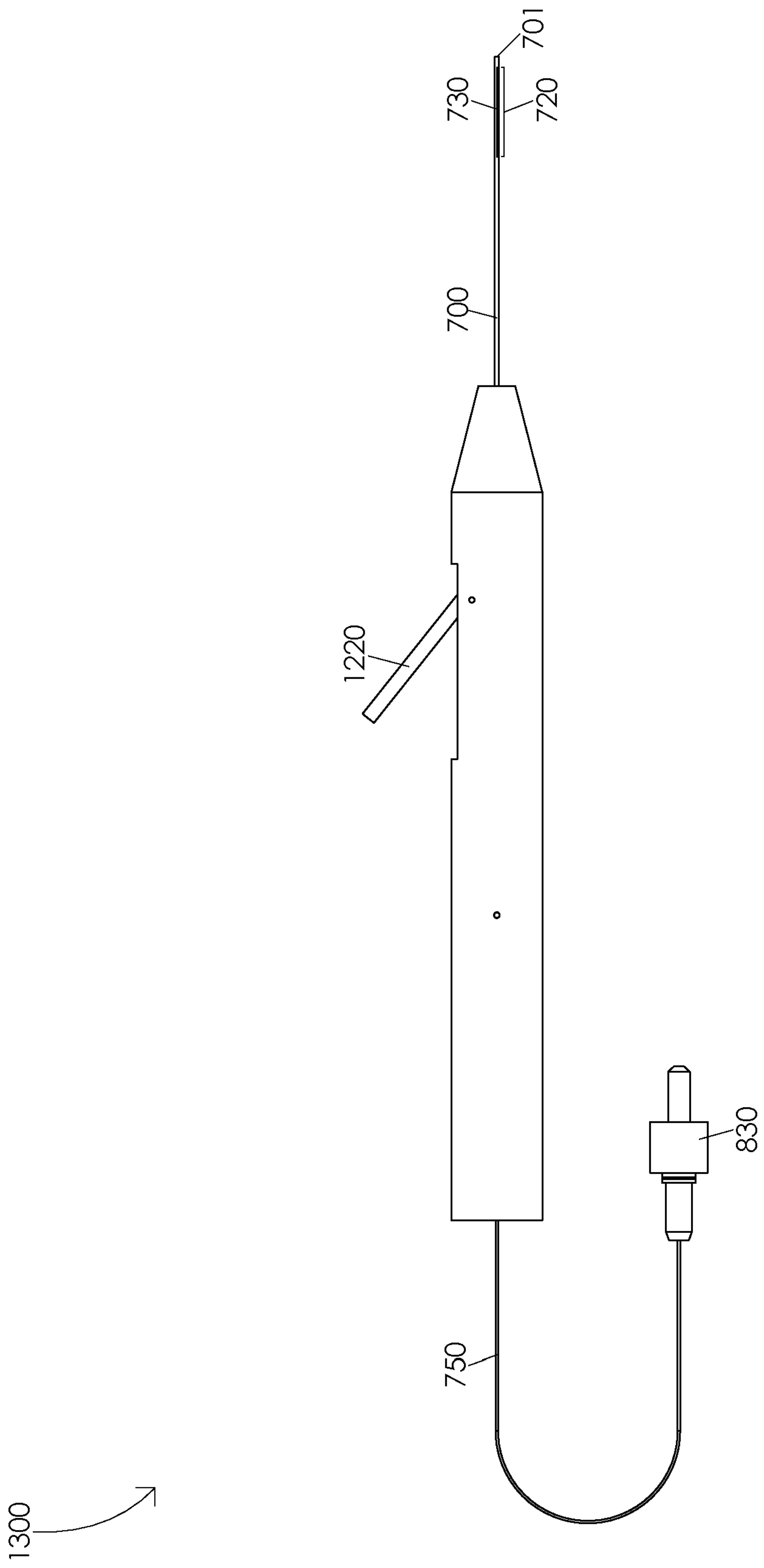

FIG. 13A

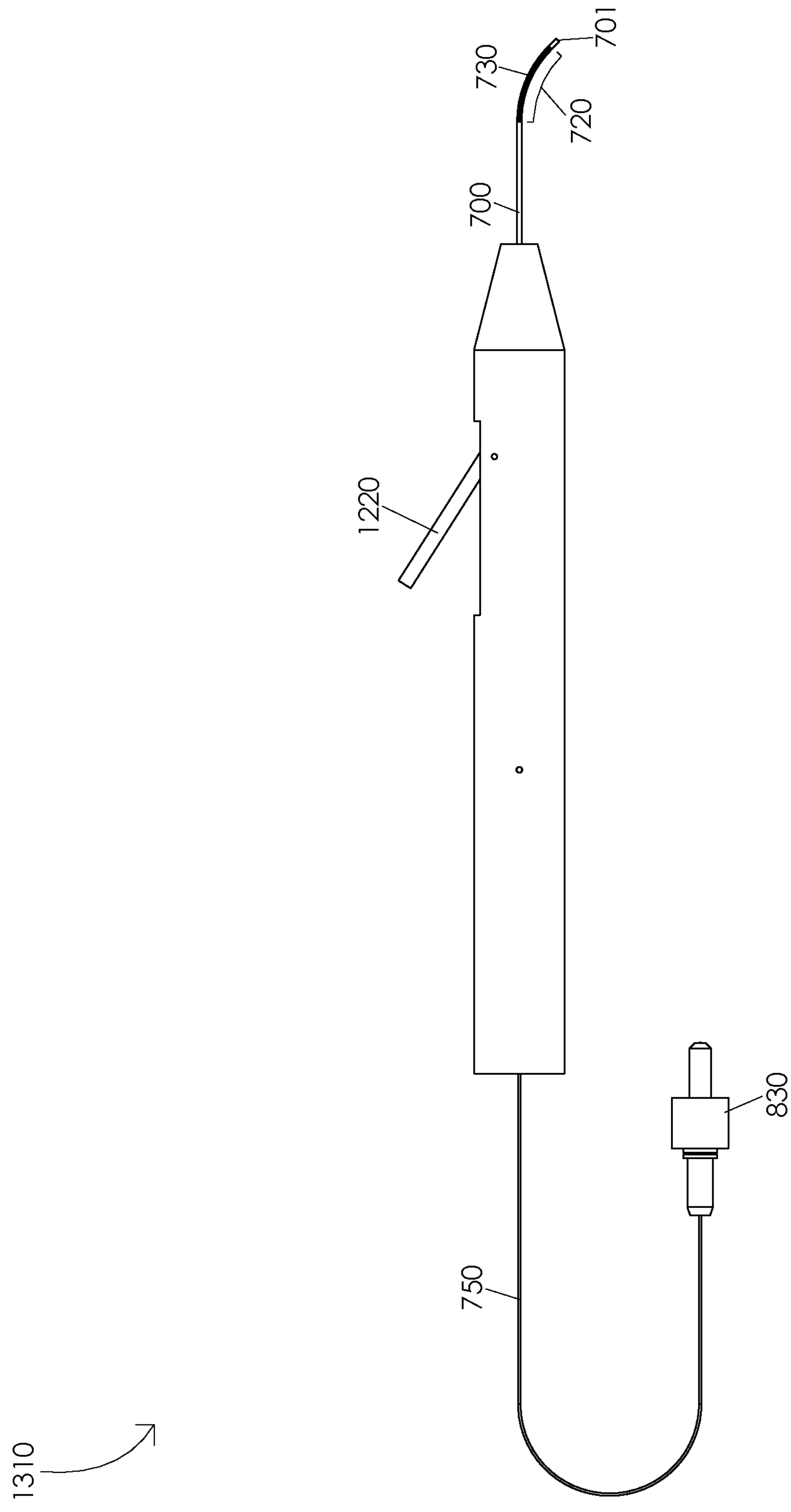

FIG. 13B

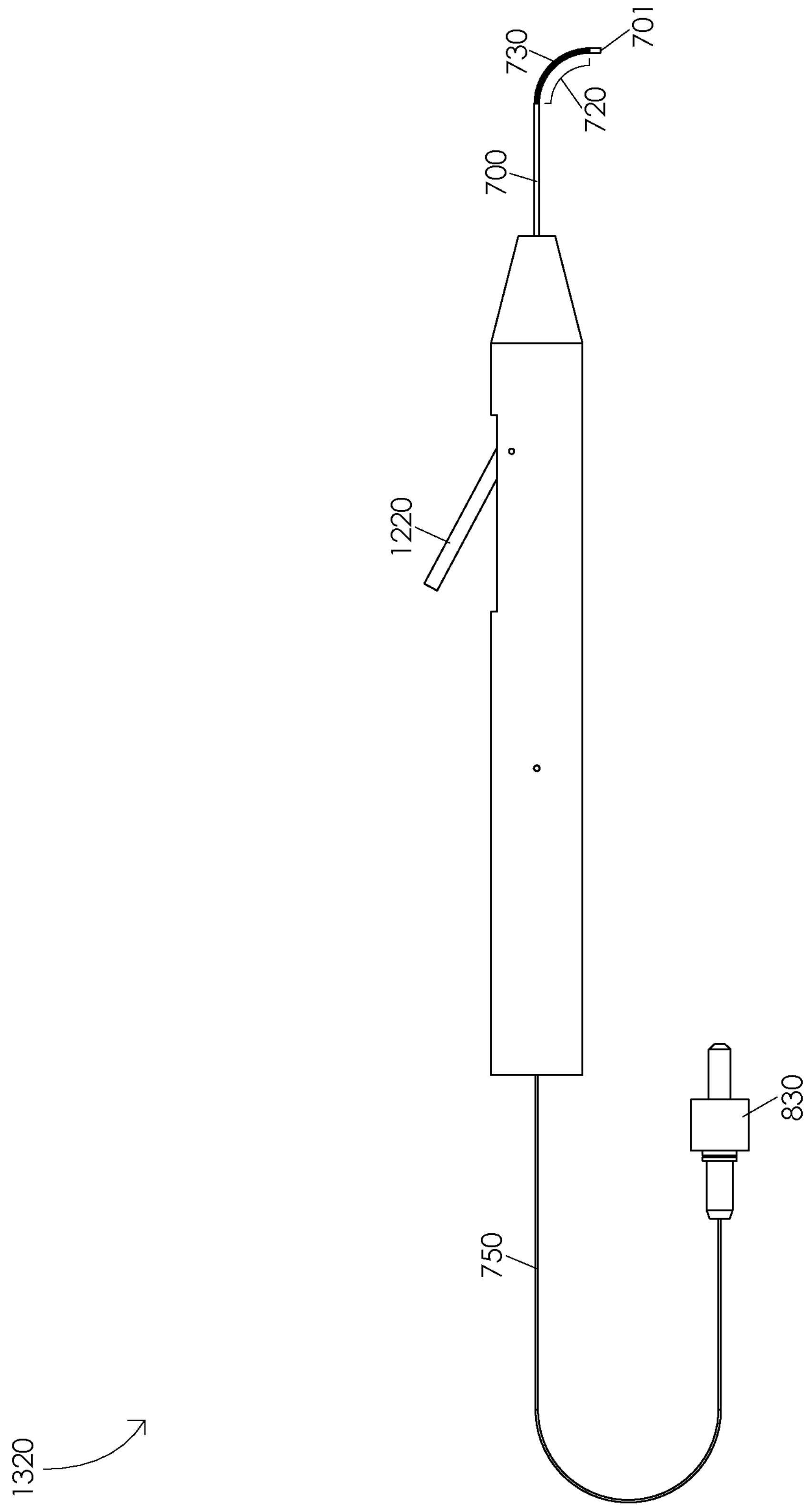

FIG. 13C

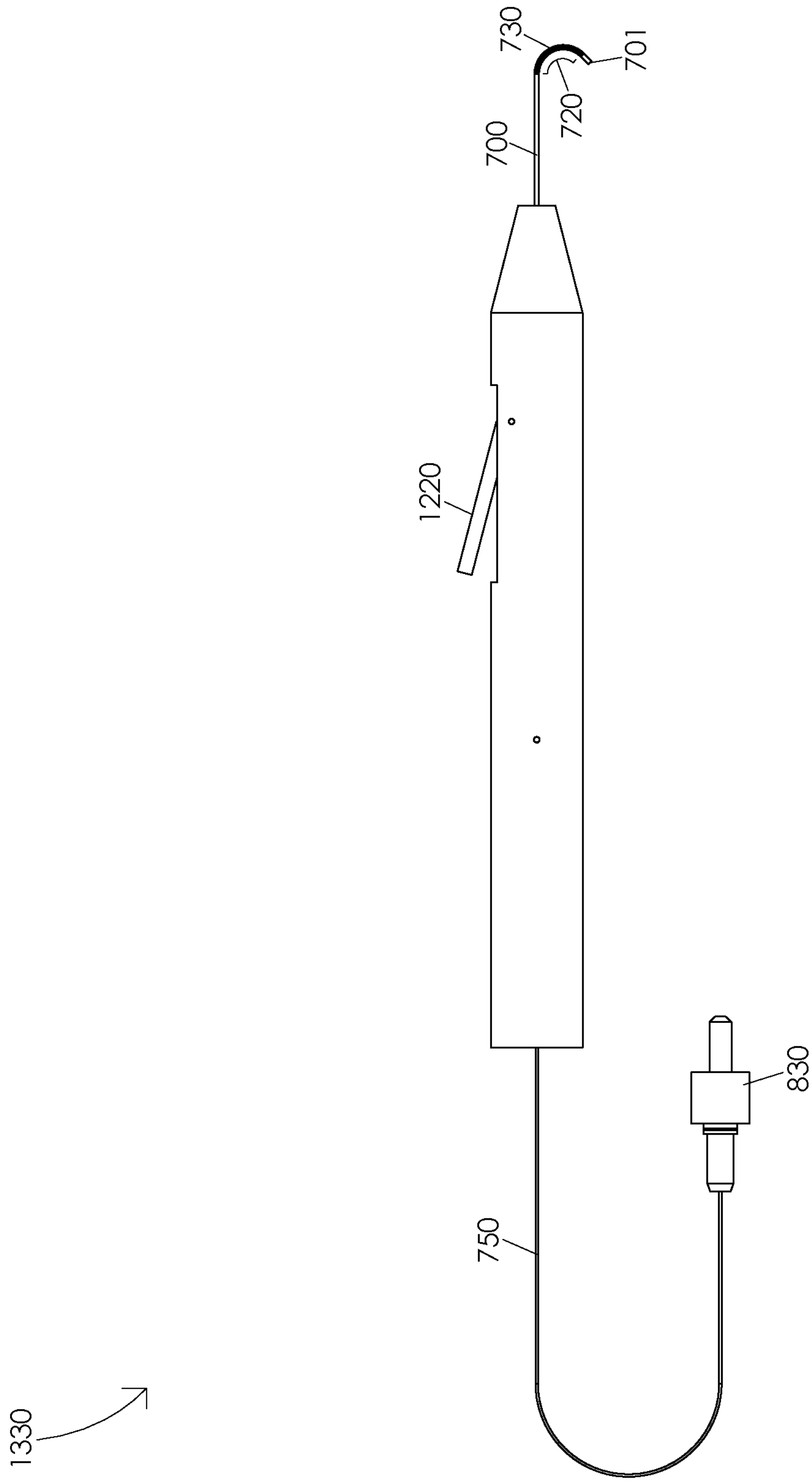

FIG. 13D

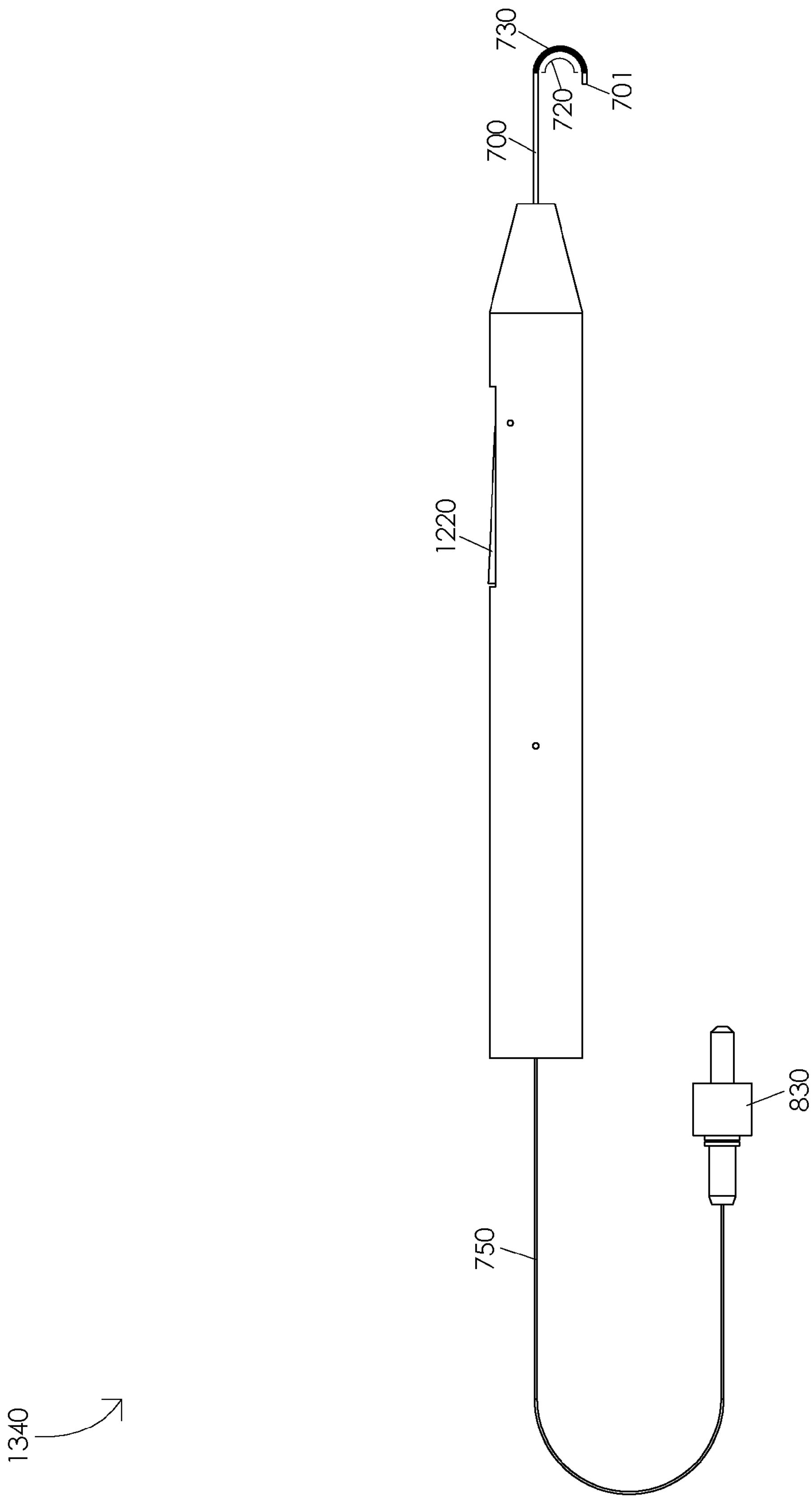

FIG. 13E

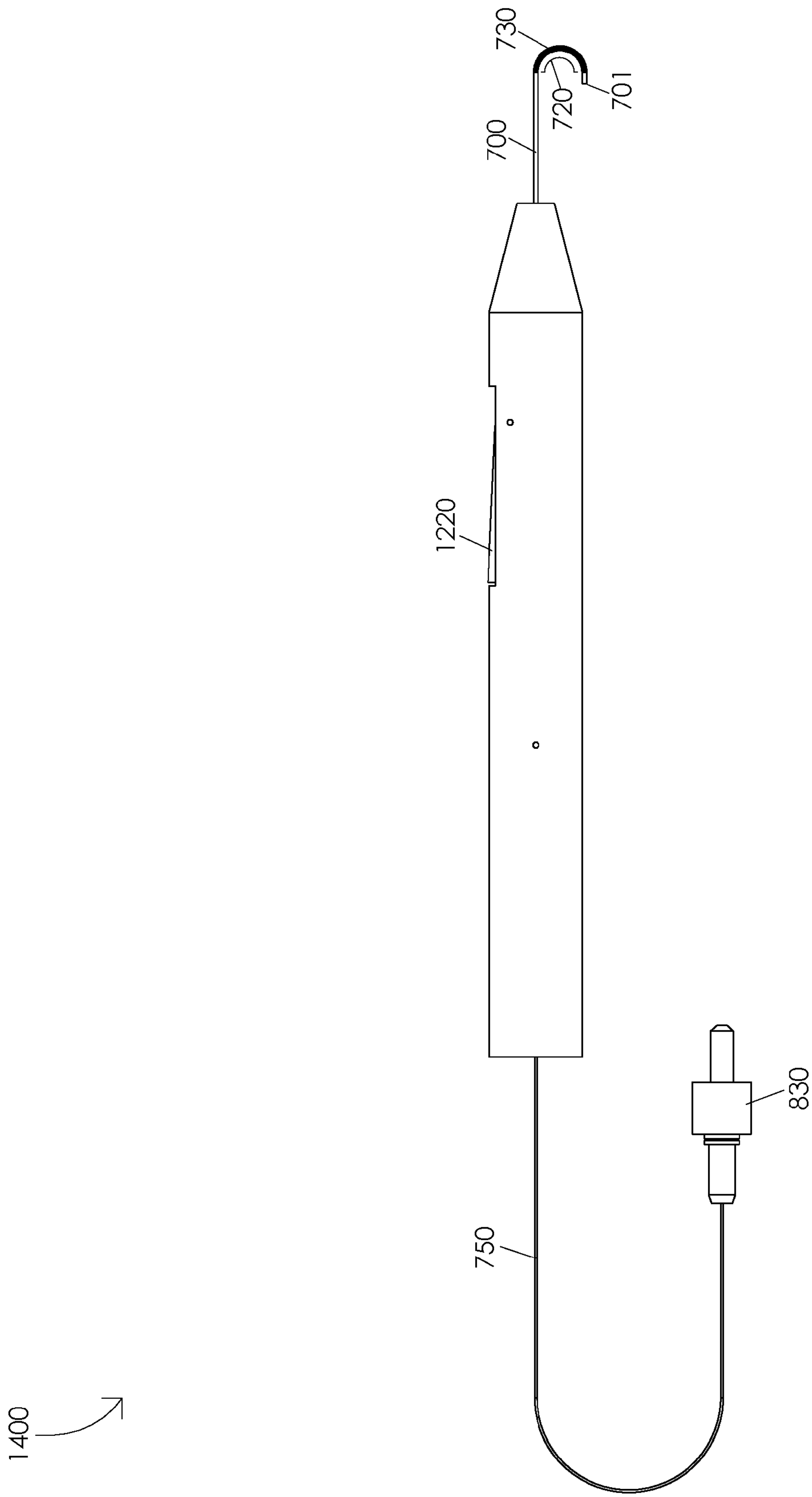

FIG. 14A

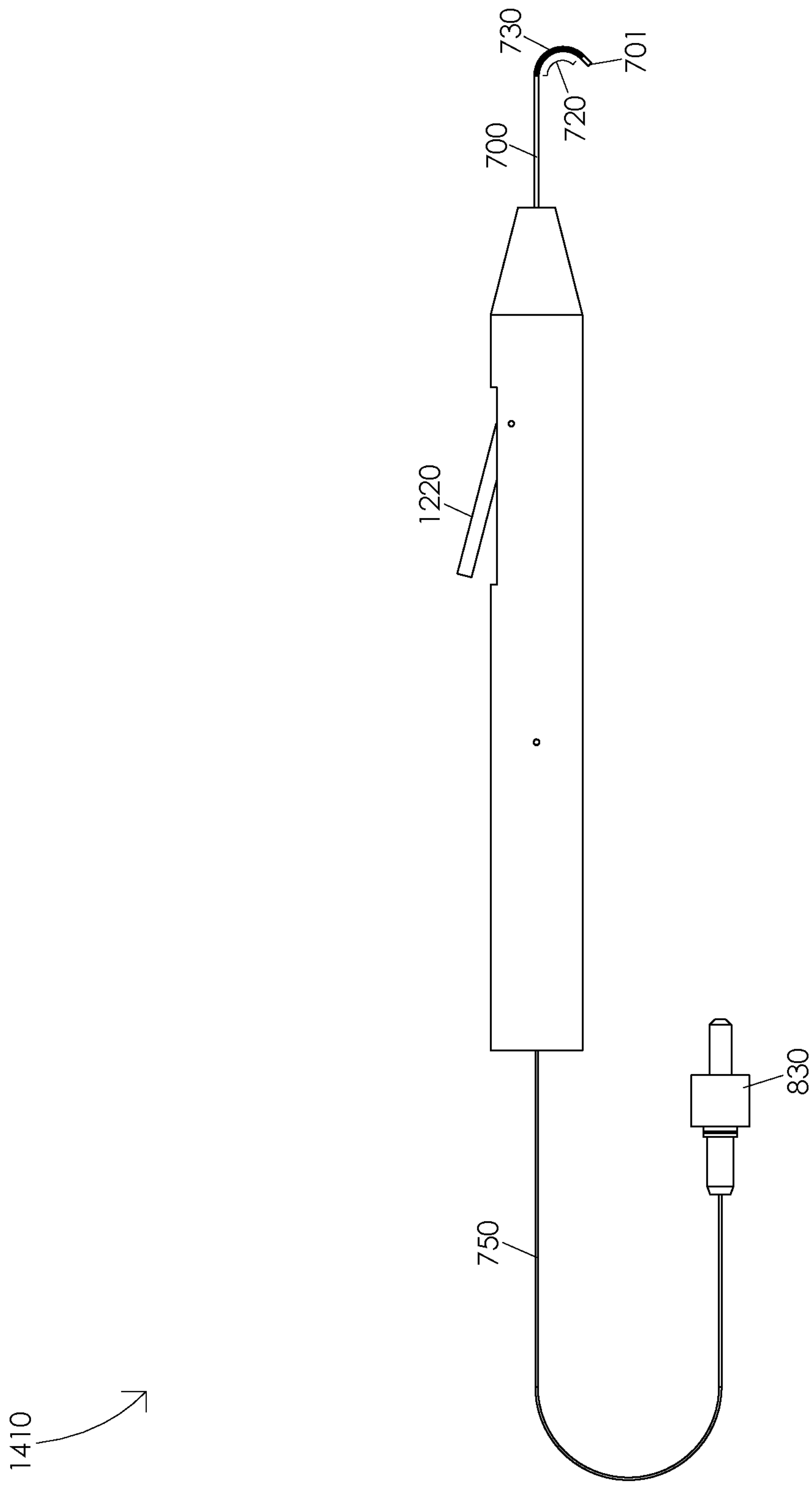

FIG. 14B

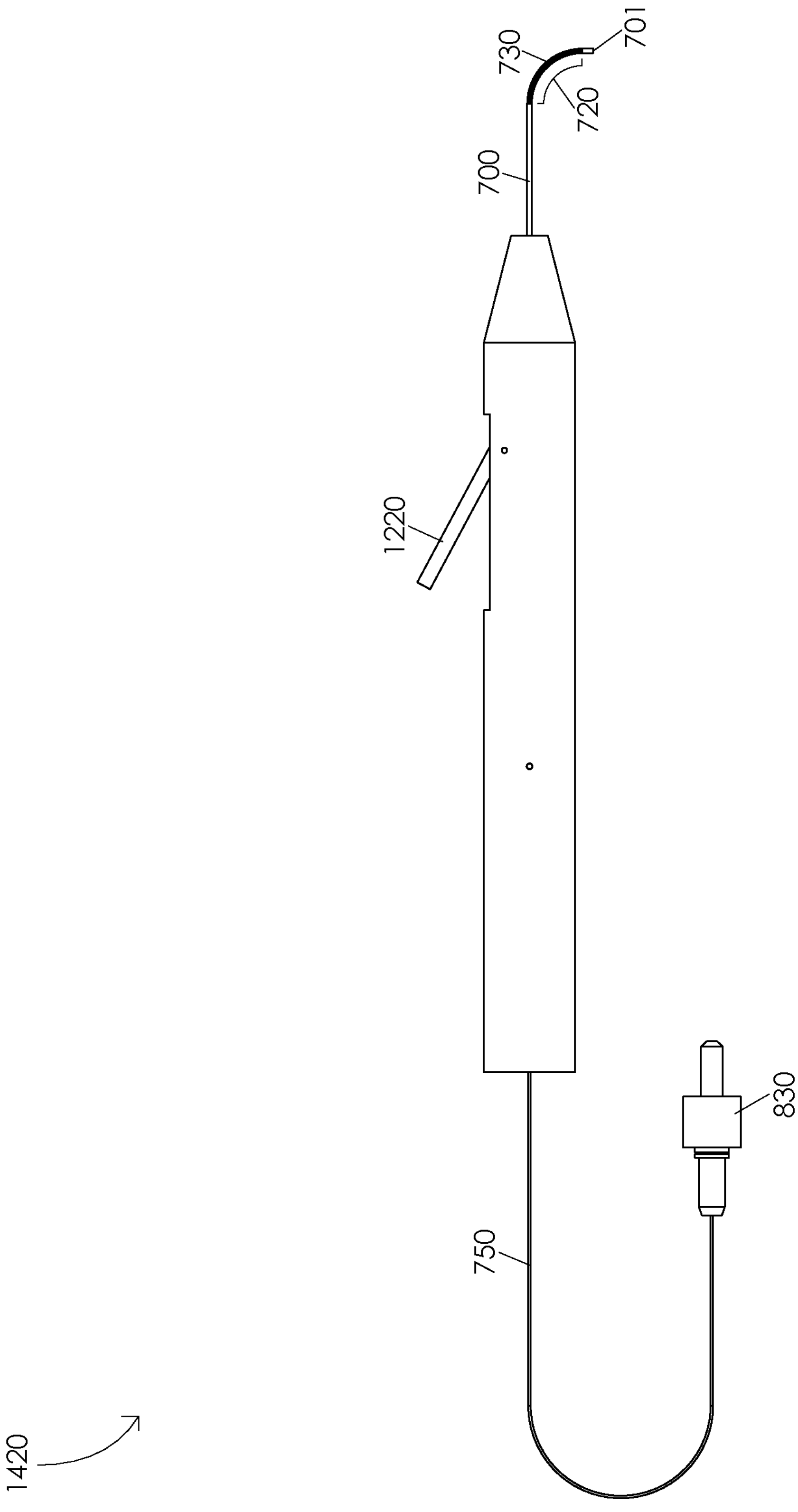

FIG. 14C

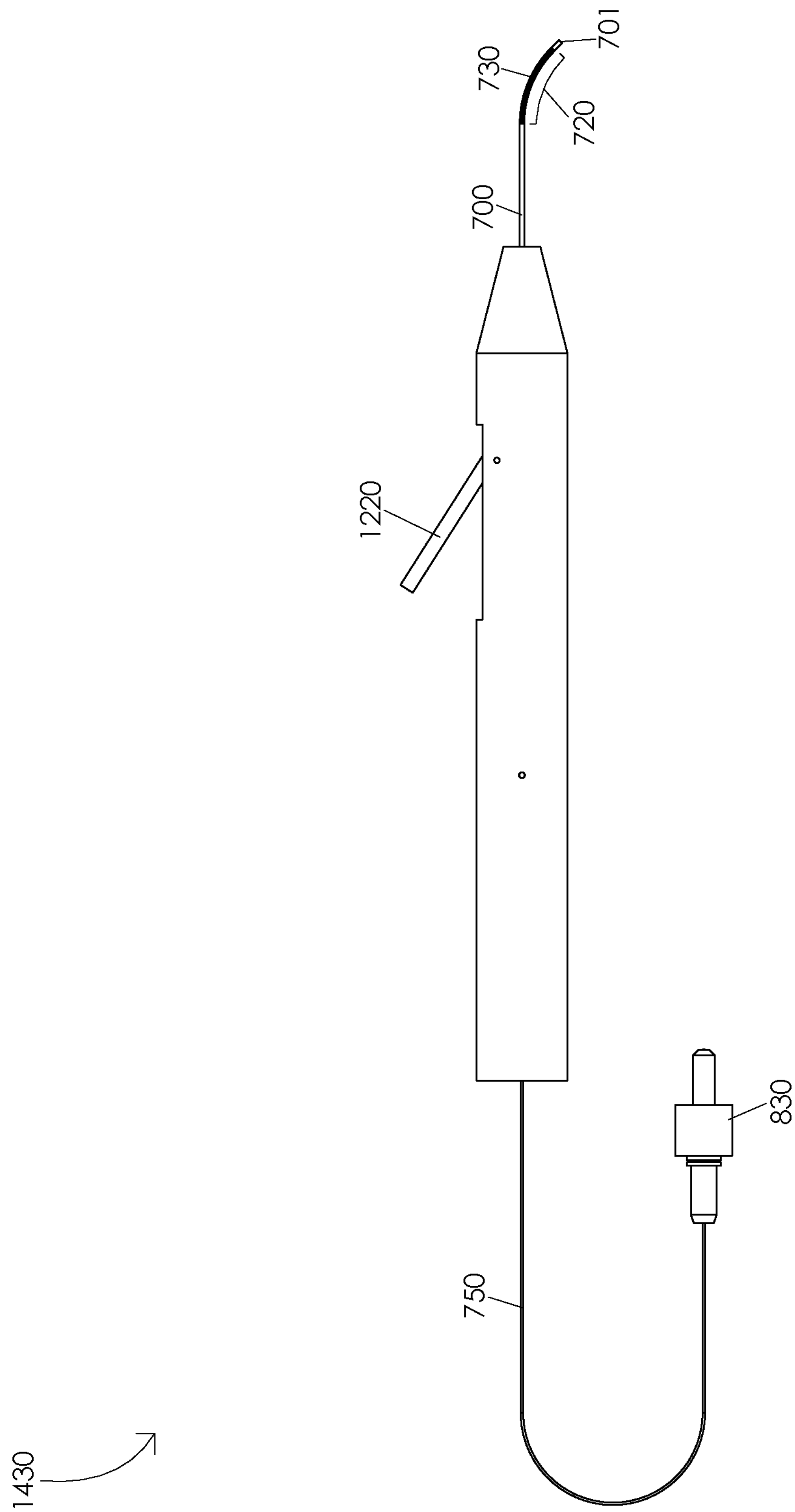

FIG. 14D

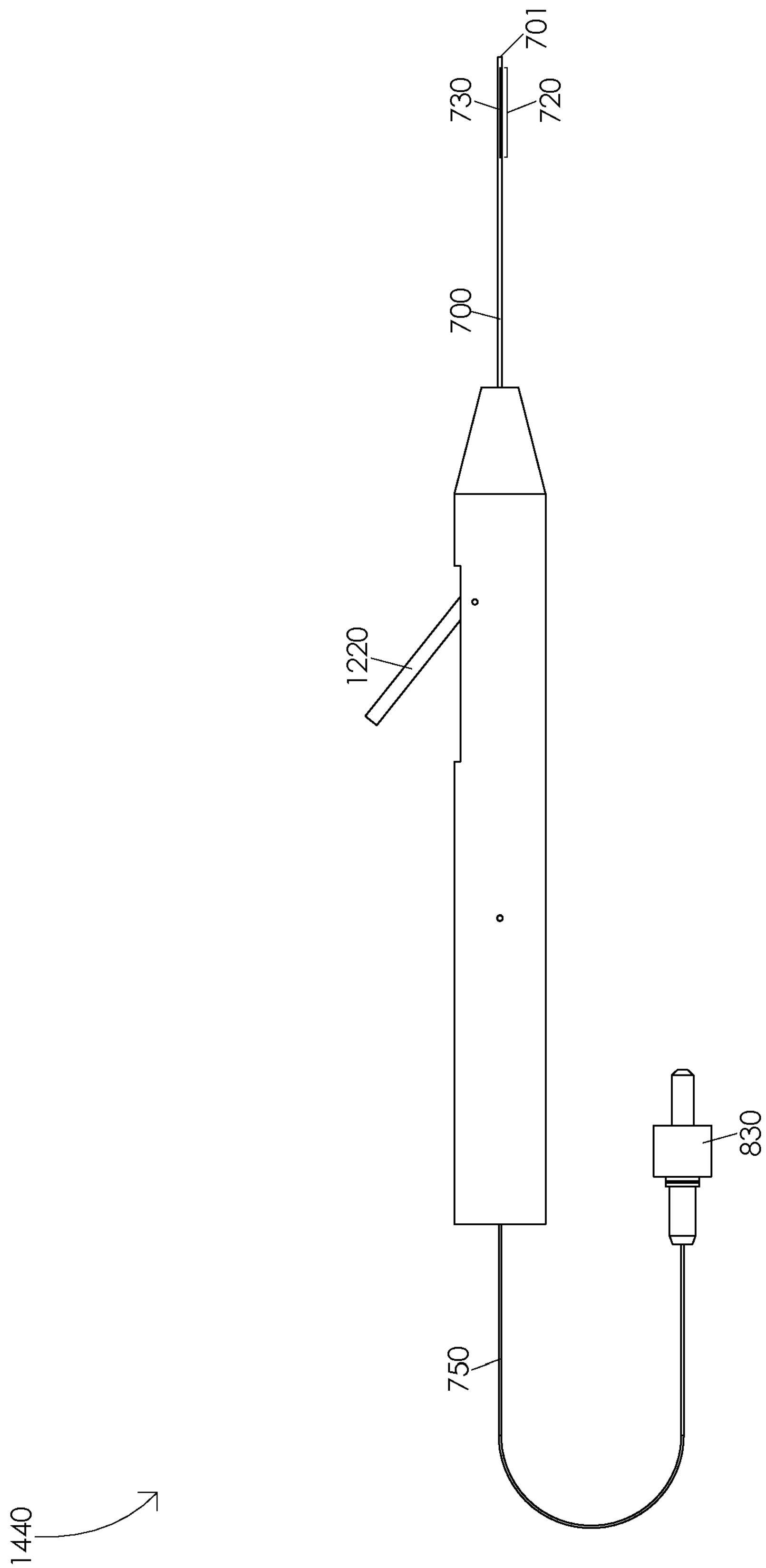

FIG. 14E

STEERABLE LASER PROBE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 61/555,268, filed Nov. 3, 2011.

FIELD OF THE INVENTION

The present disclosure relates to a surgical instrument, and, more particularly, to a steerable laser probe.

BACKGROUND OF THE INVENTION

A wide variety of ophthalmic procedures require a laser energy source. For example, ophthalmic surgeons may use laser photocoagulation to treat proliferative retinopathy. Proliferative retinopathy is a condition characterized by the development of abnormal blood vessels in the retina that grow into the vitreous humor. Ophthalmic surgeons may treat this condition by energizing a laser to cauterize portions of the retina to prevent the abnormal blood vessels from growing and hemorrhaging.

In order to increase the chances of a successful laser photocoagulation procedure, it is important that a surgeon is able aim the laser at a plurality of targets within the eye, e.g., by guiding or moving the laser from a first target to a second target within the eye. It is also important that the surgeon is able to easily control a movement of the laser. For example, the surgeon must be able to easily direct a laser beam by steering the beam to a first position aimed at a first target, guide the laser beam from the first position to a second position aimed at a second target, and hold the laser beam in the second position. Accordingly, there is a need for a surgical laser probe that can be easily guided to a plurality of targets within the eye.

BRIEF SUMMARY OF THE INVENTION

The present disclosure provides a steerable laser probe. In one or more embodiments, a steerable laser probe may comprise a handle, an actuation lever, an optic fiber, and a housing tube. Illustratively, the housing tube may comprise a first housing tube portion having a first stiffness and a second housing tube portion having a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness. Illustratively, the optic fiber may be disposed within the housing tube and within an inner bore of the handle. In one or more embodiments, a portion of the optic fiber may be fixed to an inner portion of the housing tube, e.g., by a biocompatible adhesive or any other suitable means.

Illustratively, an actuation of the actuation lever, e.g., as a result of an application of a force to the actuation lever, may be configured to gradually compress a first housing tube portion of the housing tube. In one or more embodiments, a compression of the first housing tube portion may be configured to gradually curve the housing tube. Illustratively, a gradual curving of the housing tube may be configured to gradually curve the optic fiber.

In one or more embodiments, an actuation of the actuation lever, e.g., as a result of a reduction of a force applied to the actuation lever, may be configured to gradually decompress a first housing tube portion of the housing tube. Illustratively, a decompression of the first housing tube portion may be configured to gradually straighten the housing tube. In one or more embodiments, a gradual straightening of the housing tube may be configured to gradually straighten the optic fiber.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and further advantages of the present invention may be better understood by referring to the following description in conjunction with the accompanying drawings in which like reference numerals indicate identical or functionally similar elements:

FIGS. **1**A and **1**B are schematic diagrams illustrating a handle;

FIGS. **2**A, **2**B, and **2**C are schematic diagrams illustrating a housing tube;

FIG. **3** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly;

FIGS. **4**A, **4**B, **4**C, **4**D, and **4**E illustrate a gradual curving of an optic fiber;

FIGS. **5**A, **5**B, **5**C, **5**D, and **5**E illustrate a gradual straightening of an optic fiber;

FIGS. **6**A and **6**B are schematic diagrams illustrating a handle;

FIGS. **7**A, **7**B, and **7**C are schematic diagrams illustrating a housing tube;

FIG. **8** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly;

FIGS. **9**A, **9**B, **9**C, **9**D, and **9**E illustrate a gradual curving of an optic fiber;

FIGS. **10**A, **10**B, **10**C, **10**D, and **10**E illustrate a gradual straightening of an optic fiber;

FIGS. **11**A and **11**B are schematic diagrams illustrating a handle;

FIG. **12** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly;

FIGS. **13**A, **13**B, **13**C, **13**D, and **13**E illustrate a gradual curving of an optic fiber;

FIGS. **14**A, **14**B, **14**C, **14**D, and **14**E illustrate a gradual straightening of an optic fiber.

DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

FIGS. **1**A and **1**B are schematic diagrams illustrating a handle **100**. FIG. **1**A illustrates a top view of handle **100**. Illustratively, handle **100** may comprise a handle distal end **101** and a handle proximal end **102**. In one or more embodiments, handle **100** may comprise a handle base **110**, an actuation channel **120** having an actuation channel distal end **121** and an actuation channel proximal end **122**, and a pivot pin housing **130**. FIG. **1**B illustrates a cross-sectional view of handle **100**. Illustratively, handle **100** may comprise an inner bore **140**, an inner bore distal chamber **150**, and an optic fiber guide **160**. Handle **100** may be manufactured from any suitable material, e.g., polymers, metals, metal alloys, etc., or from any combination of suitable materials.

FIGS. **2**A, **2**B, and **2**C are schematic diagrams illustrating a housing tube **200**. In one or more embodiments, housing tube **200** may comprise a housing tube distal end **201** and a housing tube proximal end **202**. Housing tube **200** may be manufactured from any suitable material, e.g., polymers, metals, metal alloys, etc., or from any combination of suitable materials. FIG. **2**A illustrates a housing tube **200** oriented to illustrate a first housing tube portion **220**. Illustratively, first housing tube portion **220** may have a first stiffness. FIG. **2**B illustrates a housing tube **200** oriented to illustrate a second housing tube portion **230**. Illustratively, second housing tube portion **230** may have a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness. Illustratively, first housing tube portion **220** may comprise a first material having a first stiffness. In one or more embodiments, second housing tube portion **230** may comprise a second material having a second stiffness. Illustratively, the second stiffness may be greater than the first stiffness.

In one or more embodiments, first housing tube portion **220** may comprise one or more apertures configured to produce a first stiffness of first housing tube portion **220**. Illustratively, second housing tube portion **230** may comprise a solid portion of housing tube **200** having a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness. Illustratively, first housing tube portion **220** may comprise one or more apertures configured to produce a first stiffness of first housing tube portion **220**. In one or more embodiments, second housing tube portion **230** may comprise one or more apertures configured to produce a second stiffness of second housing tube portion **230**. Illustratively, the second stiffness may be greater than the first stiffness.

In one or more embodiments, first housing tube portion **220** may comprise a plurality of slits configured to separate one or more solid portions of housing tube **200**. Illustratively, a plurality of slits may be cut, e.g., laser cut, into first housing tube portion **220**. In one or more embodiments, first housing tube portion **220** may comprise a plurality of slits configured to minimize a force of friction between housing tube **200** and a cannula, e.g., as housing tube **200** is inserted into the cannula or as housing tube **200** is extracted from the cannula. For example, each slit of the plurality of slits may comprise one or more arches configured to minimize a force of friction between housing tube **200** and a cannula.

FIG. **2C** illustrates an angled view of housing tube **200**. Illustratively, an optic fiber **250** may be disposed within housing tube **200**. In one or more embodiments, optic fiber **250** may be disposed within housing tube **200** wherein an optic fiber distal end **251** may be adjacent to housing tube distal end **201**. Illustratively, optic fiber **250** may be disposed within housing tube **200** wherein a portion of optic fiber **250** may be adjacent to a portion of first housing tube portion **220**. In one or more embodiments, a portion of optic fiber **250** may be fixed to an inner portion of housing tube **200**, e.g., by a biocompatible adhesive or any other suitable means.

FIG. **3** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly **300**. In one or more embodiments, a steerable laser probe assembly **300** may comprise a handle **100**, a housing tube **200** having a housing tube distal end **201** and a housing tube proximal end **202**, an optic fiber **250** having an optic fiber distal end **251** and an optic fiber proximal end **252**, a pivot pin **310**, an actuation lever **320** having an actuation lever distal end **321** and an actuation lever proximal end **322**, and a light source interface **330**. Illustratively, light source interface **330** may be configured to interface with optic fiber proximal end **252**. In one or more embodiments, light source interface **330** may comprise a standard light source connector, e.g., an SMA connector.

Illustratively, actuation lever **320** may comprise a pivot pin guide **325**. In one or more embodiments, pivot pin **310** may be disposed within pivot pin housing **130** and pivot pin guide **325**. Illustratively, pivot pin **310** may be configured to fix a portion of actuation lever **320** to a portion of handle **100**. In one or more embodiments, pivot pin **310** may be fixed in a position within pivot pin housing **130**. For example, pivot pin **310** may be fixed in a position within pivot pin housing **130**, e.g., by an adhesive or any other suitable fixation means.

Illustratively, housing tube **200** may be fixed to handle **100**, e.g., housing tube proximal end **202** may be fixed to handle distal end **101**. In one or more embodiments, housing tube **200** may be fixed to handle **100**, e.g., by an adhesive or any suitable fixation means. Illustratively, optic fiber **250** may be disposed within inner bore **140**, actuation channel **120**, inner bore distal chamber **150**, optic fiber guide **160**, and housing tube **200**. In one or more embodiments, optic fiber **250** may be disposed within housing tube **200** wherein optic fiber distal end **251** may be adjacent to housing tube distal end **201**. Illustratively, a portion of optic fiber **250** may be fixed to an inner portion of housing tube **200**, e.g., by a biocompatible adhesive or by any other suitable fixation means.

In one or more embodiments, a portion of optic fiber **250** may be fixed to a portion of actuation lever **320**, e.g., a portion of optic fiber **250** may be fixed to actuation lever proximal end **322**. Illustratively, an application of a force to actuation lever **320** may be configured to actuate actuation lever **320**, e.g., within actuation channel **120**. In one or more embodiments, an application of a force to actuation lever **320** may be configured to rotate actuation lever **320** about pivot pin **310**. Illustratively, an application of a force to actuation lever **320** may be configured to rotate actuation lever distal end **321** and actuation lever proximal end **322** about pivot pin **310**, e.g., in a clockwise direction. In one or more embodiments, an application of a force to actuation lever **320** may be configured to actuate actuation lever distal end **321** away from handle proximal end **102** and configured to actuate actuation lever proximal end **322** towards handle proximal end **102**. For example, an application of a force to actuation lever **320** may be configured to retract actuation lever proximal end **322** relative to handle base **110**.

Illustratively, an actuation of actuation lever proximal end **322** towards handle proximal end **102**, e.g., due to an application of a force to actuation lever **320**, may be configured to retract optic fiber **250** relative to housing tube **200**. In one or more embodiments, a retraction of optic fiber **250** relative to housing tube **200** may be configured to cause optic fiber **250** to apply a compressive force to an inner portion of housing tube **200**. Illustratively, an application of a compressive force to an inner portion of housing tube **200** may be configured to gradually compress a portion of housing tube **200**, e.g., a first housing tube portion **220** of housing tube **200**. In one or more embodiments, a gradual compression of a portion of housing tube **200** may be configured to cause housing tube **200** to gradually curve. Illustratively, a gradual curving of housing tube **200** may be configured to gradually curve optic fiber **250**.

In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to actuate actuation lever **320**, e.g., within actuation channel **120**. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to rotate actuation lever **320** about pivot pin **310**. In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to rotate actuation lever distal end **321** and actuation lever proximal end **322** about pivot pin **310**, e.g., in a counter-clockwise direction. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to actuate actuation lever distal end **321** towards handle proximal end **102** and configured to actuate actuation lever proximal end **322** away from handle proximal end **102**. For example, a reduction of a force applied to actuation lever **320** may be configured to extend actuation lever proximal end **322** relative to handle base **110**.

In one or more embodiments, an actuation of actuation lever proximal end **322** away from handle proximal end **102**, e.g., due to a reduction of a force applied to actuation lever **320**, may be configured to extend optic fiber **250** relative to housing tube **200**. Illustratively, an extension of optic fiber

250 relative to housing tube 200 may be configured to cause optic fiber 250 to reduce a compressive force applied to an inner portion of housing tube 200. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube 200 may be configured to gradually decompress a portion of housing tube 200, e.g., a first housing tube portion 220 of housing tube 200. Illustratively, a gradual decompression of a portion of housing tube 200 may be configured to cause housing tube 200 to gradually straighten. In one or more embodiments, a gradual straightening of housing tube 200 may be configured to gradually straighten optic fiber 250.

FIGS. 4A, 4B, 4C, 4D, and 4E illustrate a gradual curving of an optic fiber 250. FIG. 4A illustrates a straight optic fiber 400. In one or more embodiments, optic fiber 250 may comprise a straight optic fiber 400, e.g., when actuation lever proximal end 322 is fully extended relative to handle base 110. Illustratively, optic fiber 250 may comprise a straight optic fiber 400, e.g., when first housing tube portion 220 is fully decompressed. In one or more embodiments, a line tangent to optic fiber distal end 251 may be parallel to a line tangent to housing tube proximal end 202, e.g., when optic fiber 250 comprises a straight optic fiber 400.

FIG. 4B illustrates an optic fiber in a first curved position 410. Illustratively, an actuation of actuation lever 320, e.g., in a clockwise direction about pivot pin 310, may be configured to gradually curve optic fiber 250. For example, an actuation of actuation lever 320, e.g., due to an application of a force to actuation lever 320, may be configured to gradually curve optic fiber 250. In one or more embodiments, an application of a force to actuation lever 320 may be configured to gradually curve optic fiber 250 from a straight optic fiber 400 to an optic fiber in a first curved position 410. Illustratively, an application of a force to actuation lever 320 may be configured to gradually retract optic fiber 250 relative to housing tube 200. In one or more embodiments, a gradual retraction of optic fiber 250 relative to housing tube 200 may be configured to cause optic fiber 250 to apply a compressive force to an inner portion of housing tube 200. Illustratively, an application of a compressive force to an inner portion of housing tube 200 may be configured to compress a first housing tube portion 220 of housing tube 200. In one or more embodiments, an application of a compressive force to an inner portion of housing tube 200 may be configured to gradually curve housing tube 200. Illustratively, a gradual curving of housing tube 200 may be configured to gradually curve optic fiber 250, e.g., from a straight optic fiber 400 to an optic fiber in a first curved position 410. In one or more embodiments, a line tangent to optic fiber distal end 251 may intersect a line tangent to housing tube proximal end 202 at a first angle, e.g., when optic fiber 250 comprises an optic fiber in a first curved position 410. Illustratively, the first angle may comprise any angle greater than zero degrees. For example, the first angle may comprise a 45 degree angle.

FIG. 4C illustrates an optic fiber in a second curved position 420. Illustratively, an actuation of actuation lever 320, e.g., in a clockwise direction about pivot pin 310, may be configured to gradually curve optic fiber 250. For example, an actuation of actuation lever 320, e.g., due to an application of a force to actuation lever 320, may be configured to gradually curve optic fiber 250. In one or more embodiments, an application of a force to actuation lever 320 may be configured to gradually curve optic fiber 250 from an optic fiber in a first curved position 410 to an optic fiber in a second curved position 420. Illustratively, an application of a force to actuation lever 320 may be configured to gradually retract optic fiber 250 relative to housing tube 200. In one or more embodiments, a gradual retraction of optic fiber 250 relative to housing tube 200 may be configured to cause optic fiber 250 to apply a compressive force to an inner portion of housing tube 200. Illustratively, an application of a compressive force to an inner portion of housing tube 200 may be configured to compress a first housing tube portion 220 of housing tube 200. In one or more embodiments, an application of a compressive force to an inner portion of housing tube 200 may be configured to gradually curve housing tube 200. Illustratively, a gradual curving of housing tube 200 may be configured to gradually curve optic fiber 250, e.g., from an optic fiber in a first curved position 410 to an optic fiber in a second curved position 420. In one or more embodiments, a line tangent to optic fiber distal end 251 may intersect a line tangent to housing tube proximal end 202 at a second angle, e.g., when optic fiber 250 comprises an optic fiber in a second curved position 420. Illustratively, the second angle may comprise any angle greater than the first angle. For example, the second angle may comprise a 90 degree angle.

FIG. 4D illustrates an optic fiber in a third curved position 430. Illustratively, an actuation of actuation lever 320, e.g., in a clockwise direction about pivot pin 310, may be configured to gradually curve optic fiber 250. For example, an actuation of actuation lever 320, e.g., due to an application of a force to actuation lever 320, may be configured to gradually curve optic fiber 250. In one or more embodiments, an application of a force to actuation lever 320 may be configured to gradually curve optic fiber 250 from an optic fiber in a second curved position 420 to an optic fiber in a third curved position 430. Illustratively, an application of a force to actuation lever 320 may be configured to gradually retract optic fiber 250 relative to housing tube 200. In one or more embodiments, a gradual retraction of optic fiber 250 relative to housing tube 200 may be configured to cause optic fiber 250 to apply a compressive force to an inner portion of housing tube 200. Illustratively, an application of a compressive force to an inner portion of housing tube 200 may be configured to compress a first housing tube portion 220 of housing tube 200. In one or more embodiments, an application of a compressive force to an inner portion of housing tube 200 may be configured to gradually curve housing tube 200. Illustratively, a gradual curving of housing tube 200 may be configured to gradually curve optic fiber 250, e.g., from an optic fiber in a second curved position 420 to an optic fiber in a third curved position 430. In one or more embodiments, a line tangent to optic fiber distal end 251 may intersect a line tangent to housing tube proximal end 202 at a third angle, e.g., when optic fiber 250 comprises an optic fiber in a third curved position 430. Illustratively, the third angle may comprise any angle greater than the second angle. For example, the third angle may comprise a 135 degree angle.

FIG. 4E illustrates an optic fiber in a fourth curved position 440. Illustratively, an actuation of actuation lever 320, e.g., in a clockwise direction about pivot pin 310, may be configured to gradually curve optic fiber 250. For example, an actuation of actuation lever 320, e.g., due to an application of a force to actuation lever 320, may be configured to gradually curve optic fiber 250. In one or more embodiments, an application of a force to actuation lever 320 may be configured to gradually curve optic fiber 250 from an optic fiber in a third curved position 430 to an optic fiber in a forth curved position 440. Illustratively, an application of a force to actuation lever 320 may be configured to gradually retract optic fiber 250 relative to housing tube 200. In one or more embodiments, a gradual retraction of optic fiber 250 relative to housing tube 200 may be configured to cause optic fiber 250 to apply a compressive force to an inner portion of housing tube 200. Illustratively, an application of a compressive force to an inner portion of housing tube **200** may be configured to compress a first housing tube portion **220** of housing tube **200**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **200** may be configured to gradually curve housing tube **200**. Illustratively, a gradual curving of housing tube **200** may be configured to gradually curve optic fiber **250**, e.g., from an optic fiber in a third curved position **430** to an optic fiber in a fourth curved position **440**. For example, a line tangent to optic fiber distal end **251** may be parallel to a line tangent to housing tube proximal end **202**, e.g., when optic fiber **250** comprises an optic fiber in a fourth curved position **440**.

In one or more embodiments, one or more properties of a steerable laser probe may be adjusted to attain one or more desired steerable laser probe features. For example, a stiffness of first housing tube portion **220** or a stiffness of second housing tube portion **230** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. Illustratively, a material comprising first housing tube portion **220** or a material comprising second housing tube portion **230** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position.

In one or more embodiments, a number of apertures in housing tube **200** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. Illustratively, a location of one or more apertures in housing tube **200** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. In one or more embodiments, a geometry of one or more apertures in housing tube **200** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. Illustratively, a geometry of one or more apertures in housing tube **200** may be uniform, e.g., each aperture of the one or more apertures may have a same geometry. In one or more embodiments, a geometry of one or more apertures in housing tube **200** may be non-uniform, e.g., a first aperture in housing tube **200** may have a first geometry and a second aperture in housing tube **200** may have a second geometry.

Illustratively, a geometry or shape of actuation lever **320** may be adjusted to vary an amount actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. In one or more embodiments, one or more locations within housing tube **200** wherein optic fiber **250** may be fixed to an inner portion of housing tube **200** may be adjusted to vary an amount of actuation of actuation lever **320** configured to curve housing tube **200** to a particular curved position. Illustratively, at least a portion of optic fiber **250** may be enclosed in an optic fiber sleeve configured to, e.g., protect optic fiber **250**, vary a stiffness of optic fiber **250**, vary an optical property of optic fiber **250**, etc. For example, a portion of optic fiber **250** that may be fixed to actuation lever **320**, e.g., at actuation lever proximal end **322**, may be enclosed in an optic fiber sleeve configured to, e.g., protect optic fiber **250**, facilitate a fixation, etc. In one or more embodiments, a portion of optic fiber **250** that may be fixed to an inner portion of housing tube **200** may be enclosed in an optic fiber sleeve configured to, e.g., protect optic fiber **250**, facilitate a fixation, etc. Illustratively, a portion of housing tube **200** may comprise an access window, e.g., configured to allow access to an inner portion of housing tube **200**. In one or more embodiments, a portion of housing tube **200** may comprise an access window, e.g., configured to allow access to a portion of optic fiber **250**.

Illustratively, a stiffness of first housing tube portion **220** or a stiffness of second housing tube portion **230** may be adjusted to vary a bend radius of housing tube **200**. In one or more embodiments, a stiffness of first housing tube portion **220** or a stiffness of second housing tube portion **230** may be adjusted to vary a radius of curvature of housing tube **200**, e.g., when housing tube **200** is in a particular curved position. Illustratively, a number of apertures in housing tube **200** may be adjusted to vary a bend radius of housing tube **200**. In one or more embodiments, a number of apertures in housing tube **200** may be adjusted to vary a radius of curvature of housing tube **200**, e.g., when housing tube **200** is in a particular curved position. Illustratively, a location or a geometry of one or more apertures in housing tube **200** may be adjusted to vary a bend radius of housing tube **200**. In one or more embodiments, a location or a geometry of one or more apertures in housing tube **200** may be adjusted to vary a radius of curvature of housing tube **200**, e.g., when housing tube **200** is in a particular curved position.

FIGS. **5**A, **5**B, **5**C, **5**D, and **5**E illustrate a gradual straightening of an optic fiber **250**. FIG. **5**A illustrates a fully curved optic fiber **500**. In one or more embodiments, optic fiber **250** may comprise a fully curved optic fiber **500**, e.g., when actuation lever proximal end **322** is fully retracted relative to handle base **110**. Illustratively, optic fiber **250** may comprise a fully curved optic fiber **500**, e.g., when first housing tube portion **220** is fully compressed. In one or more embodiments, a line tangent to optic fiber distal end **251** may be parallel to a line tangent to housing tube proximal end **202**, e.g., when optic fiber **250** comprises a fully curved optic fiber **500**.

FIG. **5**B illustrates an optic fiber in a first partially straightened position **510**. Illustratively, an actuation of actuation lever **320**, e.g., in a counter-clockwise direction about pivot pin **310**, may be configured to gradually straighten optic fiber **250**. For example, an actuation of actuation lever **320**, e.g., due to a reduction of a force applied to actuation lever **320**, may be configured to gradually straighten optic fiber **250**. In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to gradually straighten optic fiber **250** from a fully curved optic fiber **500** to an optic fiber in a first partially straightened position **510**. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to gradually extend optic fiber **250** relative to housing tube **200**. In one or more embodiments, a gradual extension of optic fiber **250** relative to housing tube **200** may be configured to cause optic fiber **250** to reduce a compressive force applied to an inner portion of housing tube **200**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to decompress a first housing tube portion **220** of housing tube **200**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to gradually straighten housing tube **200**. Illustratively, a gradual straightening of housing tube **200** may be configured to gradually straighten optic fiber **250**, e.g., from a fully curved optic fiber **500** to an optic fiber in a first partially straightened position **510**. In one or more embodiments, a line tangent to optic fiber distal end **251** may intersect a line tangent to housing tube proximal end **202** at a first partially straightened angle, e.g., when optic fiber **250** comprises an optic fiber in a first partially straightened position **510**. Illustratively, the first partially straightened angle may comprise any angle less than 180 degrees. For example, the first partially straightened angle may comprise a 135 degree angle.

FIG. **5**C illustrates an optic fiber in a second partially straightened position **520**. Illustratively, an actuation of actuation lever **320**, e.g., in a counter-clockwise direction about pivot pin **310**, may be configured to gradually straighten optic fiber **250**. For example, an actuation of actuation lever **320**, e.g., due to a reduction of a force applied to actuation lever **320**, may be configured to gradually straighten optic fiber **250**. In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to gradually straighten optic fiber **250** from an optic fiber in a first partially straightened position **510** to an optic fiber in a second partially straightened position **520**. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to gradually extend optic fiber **250** relative to housing tube **200**. In one or more embodiments, a gradual extension of optic fiber **250** relative to housing tube **200** may be configured to cause optic fiber **250** to reduce a compressive force applied to an inner portion of housing tube **200**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to decompress a first housing tube portion **220** of housing tube **200**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to gradually straighten housing tube **200**. Illustratively, a gradual straightening of housing tube **200** may be configured to gradually straighten optic fiber **250**, e.g., from an optic fiber in a first partially straightened position **510** to an optic fiber in a second partially straightened position **520**. In one or more embodiments, a line tangent to optic fiber distal end **251** may intersect a line tangent to housing tube proximal end **202** at a second partially straightened angle, e.g., when optic fiber **250** comprises an optic fiber in a second partially straightened position **520**. Illustratively, the second partially straightened angle may comprise any angle less than the first partially straightened angle. For example, the second partially straightened angle may comprise a 90 degree angle.

FIG. **5**D illustrates an optic fiber in a third partially straightened position **530**. Illustratively, an actuation of actuation lever **320**, e.g., in a counter-clockwise direction about pivot pin **310**, may be configured to gradually straighten optic fiber **250**. For example, an actuation of actuation lever **320**, e.g., due to a reduction of a force applied to actuation lever **320**, may be configured to gradually straighten optic fiber **250**. In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to gradually straighten optic fiber **250** from an optic fiber in a second partially straightened position **520** to an optic fiber in a third partially straightened position **530**. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to gradually extend optic fiber **250** relative to housing tube **200**. In one or more embodiments, a gradual extension of optic fiber **250** relative to housing tube **200** may be configured to cause optic fiber **250** to reduce a compressive force applied to an inner portion of housing tube **200**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to decompress a first housing tube portion **220** of housing tube **200**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to gradually straighten housing tube **200**. Illustratively, a gradual straightening of housing tube **200** may be configured to gradually straighten optic fiber **250**, e.g., from an optic fiber in a second partially straightened position **520** to an optic fiber in a third partially straightened position **530**. In one or more embodiments, a line tangent to optic fiber distal end **251** may intersect a line tangent to housing tube proximal end **202** at a third partially straightened angle, e.g., when optic fiber **250** comprises an optic fiber in a third partially straightened position **530**. Illustratively, the third partially straightened angle may comprise any angle less than the second partially straightened angle. For example, the third partially straightened angle may comprise a 45 degree angle.

FIG. **5**E illustrates an optic fiber in a fully straightened position **540**. Illustratively, an actuation of actuation lever **320**, e.g., in a counter-clockwise direction about pivot pin **310**, may be configured to gradually straighten optic fiber **250**. For example, an actuation of actuation lever **320**, e.g., due to a reduction of a force applied to actuation lever **320**, may be configured to gradually straighten optic fiber **250**. In one or more embodiments, a reduction of a force applied to actuation lever **320** may be configured to gradually straighten optic fiber **250** from an optic fiber in a third partially straightened position **530** to an optic fiber in a fully straightened position **540**. Illustratively, a reduction of a force applied to actuation lever **320** may be configured to gradually extend optic fiber **250** relative to housing tube **200**. In one or more embodiments, a gradual extension of optic fiber **250** relative to housing tube **200** may be configured to cause optic fiber **250** to reduce a compressive force applied to an inner portion of housing tube **200**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to decompress a first housing tube portion **220** of housing tube **200**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **200** may be configured to gradually straighten housing tube **200**. Illustratively, a gradual straightening of housing tube **200** may be configured to gradually straighten optic fiber **250**, e.g., from an optic fiber in a third partially straightened position **530** to an optic fiber in a fully straightened position **540**. In one or more embodiments, a line tangent to optic fiber distal end **251** may be parallel to a line tangent to housing tube proximal end **202**, e.g., when optic fiber **250** comprises an optic fiber in a fully straightened position **540**.

Illustratively, a surgeon may aim optic fiber distal end **251** at any of a plurality of targets within an eye, e.g., to perform a photocoagulation procedure. In one or more embodiments, a surgeon may aim optic fiber distal end **251** at any target within a particular transverse plane of the inner eye by, e.g., rotating handle **100** to orient housing tube **200** in an orientation configured to cause a curvature of housing tube **200** within the particular transverse plane of the inner eye and varying an amount of actuation of actuation lever **320**. Illustratively, a surgeon may aim optic fiber distal end **251** at any target within a particular sagittal plane of the inner eye by, e.g., rotating handle **100** to orient housing tube **200** in an orientation configured to cause a curvature of housing tube **200** within the particular sagittal plane of the inner eye and varying an amount of actuation of actuation lever **320**. In one or more embodiments, a surgeon may aim optic fiber distal end **251** at any target within a particular frontal plane of the inner eye by, e.g., varying an amount of actuation of actuation lever **320** to orient a line tangent to optic fiber distal end **251** wherein the line tangent to optic fiber distal end **251** is within the particular frontal plane of the inner eye and rotating handle **100**. Illustratively, a surgeon may aim optic fiber distal end **251** at any target located outside of the particular transverse plane, the particular sagittal plane, and the particular frontal plane of the inner eye, e.g., by varying a rotational orientation of handle **100** and varying an amount of actuation of actuation lever **320**. In one or more embodiments, a surgeon may aim optic fiber distal end **251** at any target of a plurality of targets within an eye, e.g., without increasing a length of a portion of a steerable laser probe within the eye. Illustratively, a surgeon may aim optic fiber distal end **251** at any target of a plurality of targets within an eye, e.g., without decreasing a length of a portion of a steerable laser probe within the eye.

FIGS. **6**A and **6**B are schematic diagrams illustrating a handle **600**. FIG. **6**A illustrates a top view of handle **600**. Illustratively, handle **600** may comprise a handle distal end **601** and a handle proximal end **602**. In one or more embodiments, handle **600** may comprise a handle base **610**, an actuation channel **620** having an actuation channel distal end **621** and an actuation channel proximal end **622**, and a pivot pin housing **630**. FIG. **6**B illustrates a cross-sectional view of handle **600**. Illustratively, handle **600** may comprise an inner bore **640**, an inner bore distal chamber **650**, and an optic fiber guide **660**. Handle **600** may be manufactured from any suitable material, e.g., polymers, metals, metal alloys, etc., or from any combination of suitable materials.

FIGS. **7**A, **7**B, and **7**C are schematic diagrams illustrating a housing tube **700**. In one or more embodiments, housing tube **700** may comprise a housing tube distal end **701** and a housing tube proximal end **702**. Housing tube **700** may be manufactured from any suitable material, e.g., polymers, metals, metal alloys, etc., or from any combination of suitable materials. FIG. **7**A illustrates a housing tube **700** oriented to illustrate a first housing tube portion **720**. Illustratively, first housing tube portion **720** may have a first stiffness. FIG. **7**B illustrates a housing tube **700** oriented to illustrate a second housing tube portion **730**. Illustratively, second housing tube portion **730** may have a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness. Illustratively, first housing tube portion **720** may comprise a first material having a first stiffness. In one or more embodiments, second housing tube portion **730** may comprise a second material having a second stiffness. Illustratively, the second stiffness may be greater than the first stiffness.

In one or more embodiments, first housing tube portion **720** may comprise one or more apertures configured to produce a first stiffness of first housing tube portion **720**. Illustratively, second housing tube portion **730** may comprise a solid portion of housing tube **700** having a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness. Illustratively, first housing tube portion **720** may comprise one or more apertures configured to produce a first stiffness of first housing tube portion **720**. In one or more embodiments, second housing tube portion **730** may comprise one or more apertures configured to produce a second stiffness of second housing tube portion **730**. Illustratively, the second stiffness may be greater than the first stiffness.

In one or more embodiments, first housing tube portion **720** may comprise a plurality of slits configured to separate one or more solid portions of housing tube **700**. Illustratively, a plurality of slits may be cut, e.g., laser cut, into first housing tube portion **720**. In one or more embodiments, first housing tube portion **720** may comprise a plurality of slits configured to minimize a force of friction between housing tube **700** and a cannula, e.g., as housing tube **700** is inserted into the cannula or as housing tube **700** is extracted from the cannula. For example, each slit of the plurality of slits may comprise one or more arches configured to minimize a force of friction between housing tube **700** and a cannula.

FIG. **7**C illustrates an angled view of housing tube **700**. Illustratively, an optic fiber **750** may be disposed within housing tube **700**. In one or more embodiments, optic fiber **750** may be disposed within housing tube **700** wherein an optic fiber distal end **751** is adjacent to housing tube distal end **701**. Illustratively, optic fiber **750** may be disposed within housing tube **700** wherein a portion of optic fiber **750** may be adjacent to a portion of first housing tube portion **720**. In one or more embodiments, a portion of optic fiber **750** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or any other suitable means.

Illustratively, a wire **740** may be disposed within housing tube **700**. In one or more embodiments, wire **740** may be disposed within housing tube **700** wherein a wire distal end **741** may be adjacent to housing tube distal end **701**. Illustratively, wire **740** may be disposed within housing tube **700** wherein a portion of wire **740** may be adjacent to a portion of first housing tube portion **720**. In one or more embodiments, a portion of wire **740** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or any other suitable fixation means.

FIG. **8** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly **800**. In one or more embodiments, a steerable laser probe assembly **800** may comprise a handle **600**, a housing tube **700** having a housing tube distal end **701** and a housing tube proximal end **702**, a wire **740** having a wire distal end **741** and a wire proximal loop **742**, an optic fiber **750** having an optic fiber distal end **751** and an optic fiber proximal end **752**, a pivot pin **810**, an actuation lever **820** having an actuation lever distal end **821** and an actuation lever proximal end **822**, and a light source interface **830**. Illustratively, light source interface **830** may be configured to interface with optic fiber proximal end **752**. In one or more embodiments, light source interface **830** may comprise a standard light source connector, e.g., an SMA connector.

Illustratively, actuation lever **820** may comprise a pivot pin guide **825**. In one or more embodiments, pivot pin **810** may be disposed within pivot pin housing **630** and pivot pin guide **825**. Illustratively, pivot pin **810** may be configured to fix a portion of actuation lever **820** to a portion of handle **600**. In one or more embodiments, pivot pin **810** may be fixed in a position within pivot pin housing **630**. For example, pivot pin **810** may be fixed in a position within pivot pin housing **630**, e.g., by an adhesive or any other suitable fixation means.

Illustratively, housing tube **700** may be fixed to handle **600**, e.g., housing tube proximal end **702** may be fixed to handle distal end **601**. In one or more embodiments, housing tube **700** may be fixed to handle **600**, e.g., by an adhesive or any suitable fixation means. Illustratively, actuation lever **820** may comprise a wire proximal loop housing **826**. In one or more embodiments, wire proximal loop **742** may be disposed within wire proximal loop housing **826**. Illustratively, wire proximal loop **742** may be fixed within wire proximal loop housing **826**, e.g., by an adhesive or any suitable fixation means. In one or more embodiments, a portion of actuation lever **820** may be disposed within wire proximal loop **742**, e.g., wire proximal loop **742** may be looped around a portion of actuation lever **820**. Illustratively, wire **740** may be disposed within actuation channel **620**, inner bore distal chamber **650**, optic fiber guide **660**, and housing tube **700**. In one or more embodiments, wire **740** may be disposed within housing tube **700** wherein wire distal end **741** may be adjacent to housing tube distal end **701**. Illustratively, wire **740** may be disposed within housing tube **700** wherein a portion of wire **740** may be adjacent to a portion of first housing tube portion **720**. In one or more embodiments, a portion of wire **740** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or by any other suitable fixation means.

Illustratively, optic fiber **750** may be disposed within inner bore **640**, actuation channel **620**, inner bore distal chamber **650**, optic fiber guide **660**, and housing tube **700**. In one or more embodiments, optic fiber **750** may be disposed within housing tube **700** wherein optic fiber distal end **751** may be adjacent to housing tube distal end **701**. Illustratively, a portion of optic fiber **750** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or by any other suitable fixation means.

In one or more embodiments, an application of a force to actuation lever **820** may be configured to actuate actuation lever **820**, e.g., within actuation channel **620**. Illustratively, an application of a force to actuation lever **820** may be configured to rotate actuation lever **820** about pivot pin **810**. In one or more embodiments, an application of a force to actuation lever **820** may be configured to rotate actuation lever distal end **821** and actuation lever proximal end **822** about pivot pin **810**, e.g., in a clockwise direction. Illustratively, an application of a force to actuation lever **820** may be configured to actuate actuation lever distal end **821** away from handle proximal end **602** and configured to actuate actuation lever proximal end **822** towards handle proximal end **602**. For example, an application of a force to actuation lever **820** may be configured to retract actuation lever proximal end **822** relative to handle base **610**.

Illustratively, an actuation of actuation lever proximal end **822** towards handle proximal end **602**, e.g., due to an application of a force to actuation lever **820**, may be configured to retract wire **740** relative to housing tube **700**. In one or more embodiments, a retraction of wire **740** relative to housing tube **700** may be configured to cause wire **740** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually compress a portion of housing tube **700**, e.g., a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a gradual compression of a portion of housing tube **700** may be configured to cause housing tube **700** to gradually curve. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**.

In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to actuate actuation lever **820**, e.g., within actuation channel **620**. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to rotate actuation lever **820** about pivot pin **810**. In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to rotate actuation lever distal end **821** and actuation lever proximal end **822** about pivot pin **810**, e.g., in a counter-clockwise direction. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to actuate actuation lever distal end **821** towards handle proximal end **602** and configured to actuate actuation lever proximal end **822** away from handle proximal end **602**. For example, a reduction of a force applied to actuation lever **820** may be configured to extend actuation lever proximal end **822** relative to handle base **610**.

In one or more embodiments, an actuation of actuation lever proximal end **822** away from handle proximal end **602**, e.g., due to a reduction of a force applied to actuation lever **820**, may be configured to extend wire **740** relative to housing tube **700**. Illustratively, an extension of wire **740** relative to housing tube **700** may be configured to cause wire **740** to reduce a compressive force applied to an inner portion of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually decompress a portion of housing tube **700**, e.g., a first housing tube portion **720** of housing tube **700**. Illustratively, a gradual decompression of a portion of housing tube **700** may be configured to cause housing tube **700** to gradually straighten. In one or more embodiments, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**.

FIGS. **9**A, **9**B, **9**C, **9**D, and **9**E illustrate a gradual curving of an optic fiber **750**. FIG. **9**A illustrates a straight optic fiber **900**. In one or more embodiments, optic fiber **750** may comprise a straight optic fiber **900**, e.g., when actuation lever proximal end **822** is fully extended relative to handle base **610**. Illustratively, optic fiber **750** may comprise a straight optic fiber **900**, e.g., when first housing tube portion **720** is fully decompressed. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises a straight optic fiber **900**.

FIG. **9**B illustrates an optic fiber in a first curved position **910**. Illustratively, an actuation of actuation lever **820**, e.g., in a clockwise direction about pivot pin **810**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to an application of a force to actuation lever **820**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **820** may be configured to gradually curve optic fiber **750** from a straight optic fiber **900** to an optic fiber in a first curved position **910**. Illustratively, an application of a force to actuation lever **820** may be configured to gradually retract wire **740** relative to housing tube **700**. In one or more embodiments, a gradual retraction of wire **740** relative to housing tube **700** may be configured to cause wire **740** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from a straight optic fiber **900** to an optic fiber in a first curved position **910**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a first angle, e.g., when optic fiber **750** comprises an optic fiber in a first curved position **910**. Illustratively, the first angle may comprise any angle greater than zero degrees. For example, the first angle may comprise a 45 degree angle.

FIG. **9**C illustrates an optic fiber in a second curved position **920**. Illustratively, an actuation of actuation lever **820**, e.g., in a clockwise direction about pivot pin **810**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to an application of a force to actuation lever **820**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **820** may be configured to gradually curve optic fiber **750** from an optic fiber in a first curved position **910** to an optic fiber in a second curved position **920**. Illustratively, an application of a force to actuation lever **820** may be configured to gradually retract wire **740** relative to housing tube **700**. In one or more embodiments, a gradual retraction of wire **740** relative to housing tube **700** may be configured to cause wire **740** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a first curved position **910** to an optic fiber in a second curved position **920**.

In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a second angle, e.g., when optic fiber **750** comprises an optic fiber in a second curved position **920**. Illustratively, the second angle may comprise any angle greater than the first angle. For example, the second angle may comprise a 90 degree angle.

FIG. **9**D illustrates an optic fiber in a third curved position **930**. Illustratively, an actuation of actuation lever **820**, e.g., in a clockwise direction about pivot pin **810**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to an application of a force to actuation lever **820**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **820** may be configured to gradually curve optic fiber **750** from an optic fiber in a second curved position **920** to an optic fiber in a third curved position **930**. Illustratively, an application of a force to actuation lever **820** may be configured to gradually retract wire **740** relative to housing tube **700**. In one or more embodiments, a gradual refraction of wire **740** relative to housing tube **700** may be configured to cause wire **740** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a second curved position **920** to an optic fiber in a third curved position **930**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a third angle, e.g., when optic fiber **750** comprises an optic fiber in a third curved position **930**. Illustratively, the third angle may comprise any angle greater than the second angle. For example, the third angle may comprise a 135 degree angle.

FIG. **9**E illustrates an optic fiber in a fourth curved position **940**. Illustratively, an actuation of actuation lever **820**, e.g., in a clockwise direction about pivot pin **810**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to an application of a force to actuation lever **820**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **820** may be configured to gradually curve optic fiber **750** from an optic fiber in a third curved position **930** to an optic fiber in a forth curved position **940**. Illustratively, an application of a force to actuation lever **820** may be configured to gradually retract wire **740** relative to housing tube **700**. In one or more embodiments, a gradual retraction of wire **740** relative to housing tube **700** may be configured to cause wire **740** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a third curved position **930** to an optic fiber in a fourth curved position **940**. For example, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises an optic fiber in a fourth curved position **940**.

In one or more embodiments, one or more properties of a steerable laser probe may be adjusted to attain one or more desired steerable laser probe features. For example, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. Illustratively, a material comprising first housing tube portion **720** or a material comprising second housing tube portion **730** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position.

In one or more embodiments, a number of apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. Illustratively, a location of one or more apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. In one or more embodiments, a geometry of one or more apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. Illustratively, a geometry of one or more apertures in housing tube **700** may be uniform, e.g., each aperture of the one or more apertures may have a same geometry. In one or more embodiments, a geometry of one or more apertures in housing tube **700** may be non-uniform, e.g., a first aperture in housing tube **700** may have a first geometry and a second aperture in housing tube **700** may have a second geometry.

Illustratively, a geometry or shape of actuation lever **820** may be adjusted to vary an amount actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. In one or more embodiments, one or more locations within housing tube **700** wherein wire **740** may be fixed to an inner portion of housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **820** configured to curve housing tube **700** to a particular curved position. Illustratively, a portion of wire **740** may be fixed to an outer portion of housing tube **700**. In one or more embodiments, a portion of wire **740** may be looped around a portion of housing tube **700**. For example, wire proximal loop **742** may be adjusted to comprise a straight portion of wire **740**. Illustratively, a portion of housing tube **700** may comprise an access window, e.g., configured to allow access to an inner portion of housing tube **700**. In one or more embodiments, a portion of housing tube **700** may comprise an access window, e.g., configured to allow access to a portion of optic fiber **750** or a portion of wire **740**. Illustratively, at least a portion of optic fiber **750** may be enclosed in an optic fiber sleeve configured to, e.g., protect optic fiber **750**, vary a stiffness of optic fiber **750**, vary an optical property of optic fiber **750**, etc.

In one or more embodiments, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position. In one or more embodiments, a number of apertures in housing tube **700** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a number of apertures in housing tube **700** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position. In one or more embodiments, a location or a geometry of one or more apertures in housing tube **700** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a location or a geometry of one or more apertures in housing tube **700** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position.

FIGS. **10**A, **10**B, **10**C, **10**D, and **10**E illustrate a gradual straightening of an optic fiber **750**. FIG. **10**A illustrates a fully curved optic fiber **1000**. In one or more embodiments, optic fiber **750** may comprise a fully curved optic fiber **1000**, e.g., when actuation lever proximal end **822** is fully retracted relative to handle base **610**. Illustratively, optic fiber **750** may comprise a fully curved optic fiber **1000**, e.g., when first housing tube portion **720** is fully compressed. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises a fully curved optic fiber **1000**.

FIG. **10**B illustrates an optic fiber in a first partially straightened position **1010**. Illustratively, an actuation of actuation lever **820**, e.g., in a counter-clockwise direction about pivot pin **810**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to a reduction of a force applied to actuation lever **820**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to gradually straighten optic fiber **750** from a fully curved optic fiber **1000** to an optic fiber in a first partially straightened position **1010**. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to gradually extend wire **740** relative to housing tube **700**. In one or more embodiments, a gradual extension of wire **740** relative to housing tube **700** may be configured to cause wire **740** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from a fully curved optic fiber **1000** to an optic fiber in a first partially straightened position **1010**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a first partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a first partially straightened position **1010**. Illustratively, the first partially straightened angle may comprise any angle less than 180 degrees. For example, the first partially straightened angle may comprise a 135 degree angle.

FIG. **10**C illustrates an optic fiber in a second partially straightened position **1020**. Illustratively, an actuation of actuation lever **820**, e.g., in a counter-clockwise direction about pivot pin **810**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to a reduction of a force applied to actuation lever **820**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to gradually straighten optic fiber **750** from an optic fiber in a first partially straightened position **1010** to an optic fiber in a second partially straightened position **1020**. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to gradually extend wire **740** relative to housing tube **700**. In one or more embodiments, a gradual extension of wire **740** relative to housing tube **700** may be configured to cause wire **740** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a first partially straightened position **1010** to an optic fiber in a second partially straightened position **1020**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a second partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a second partially straightened position **1020**. Illustratively, the second partially straightened angle may comprise any angle less than the first partially straightened angle. For example, the second partially straightened angle may comprise a 90 degree angle.

FIG. **10**D illustrates an optic fiber in a third partially straightened position **1030**. Illustratively, an actuation of actuation lever **820**, e.g., in a counter-clockwise direction about pivot pin **810**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to a reduction of a force applied to actuation lever **820**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to gradually straighten optic fiber **750** from an optic fiber in a second partially straightened position **1020** to an optic fiber in a third partially straightened position **1030**. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to gradually extend wire **740** relative to housing tube **700**. In one or more embodiments, a gradual extension of wire **740** relative to housing tube **700** may be configured to cause wire **740** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a second partially straightened position **1020** to an optic fiber in a third partially straightened position **1030**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a third partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a third partially straightened position **1030**. Illustratively, the third partially straightened angle may comprise any angle less than the second partially straightened angle. For example, the third partially straightened angle may comprise a 45 degree angle.

FIG. **10**E illustrates an optic fiber in a fully straightened position **1040**. Illustratively, an actuation of actuation lever **820**, e.g., in a counter-clockwise direction about pivot pin **810**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **820**, e.g., due to a reduction of a force applied to actuation lever **820**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **820** may be configured to gradually straighten optic fiber **750** from an optic fiber in a third partially straightened position **1030** to an optic fiber in a fully straightened position **1040**. Illustratively, a reduction of a force applied to actuation lever **820** may be configured to gradually extend wire **740** relative to housing tube **700**. In one or more embodiments, a gradual extension of wire **740** relative to housing tube **700** may be configured to cause wire **740** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a third partially straightened position **1030** to an optic fiber in a fully straightened position **1040**. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises an optic fiber in a fully straightened position **1040**.

Illustratively, a surgeon may aim optic fiber distal end **751** at any of a plurality of targets within an eye, e.g., to perform a photocoagulation procedure. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target within a particular transverse plane of the inner eye by, e.g., rotating handle **600** to orient housing tube **700** in an orientation configured to cause a curvature of housing tube **700** within the particular transverse plane of the inner eye and varying an amount of actuation of actuation lever **820**. Illustratively, a surgeon may aim optic fiber distal end **751** at any target within a particular sagittal plane of the inner eye by, e.g., rotating handle **600** to orient housing tube **700** in an orientation configured to cause a curvature of housing tube **700** within the particular sagittal plane of the inner eye and varying an amount of actuation of actuation lever **820**. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target within a particular frontal plane of the inner eye by, e.g., varying an amount of actuation of actuation lever **820** to orient a line tangent to optic fiber distal end **751** wherein the line tangent to optic fiber distal end **751** is within the particular frontal plane of the inner eye and rotating handle **600**. Illustratively, a surgeon may aim optic fiber distal end **751** at any target located outside of the particular transverse plane, the particular sagittal plane, and the particular frontal plane of the inner eye, e.g., by varying a rotational orientation of handle **600** and varying an amount of actuation of actuation lever **820**. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target of a plurality of targets within an eye, e.g., without increasing a length of a portion of a steerable laser probe within the eye. Illustratively, a surgeon may aim optic fiber distal end **751** at any target of a plurality of targets within an eye, e.g., without decreasing a length of a portion of a steerable laser probe within the eye.

FIGS. **11**A and **11**B are schematic diagrams illustrating a handle **1100**. FIG. **11**A illustrates a top view of handle **1100**. Illustratively, handle **1100** may comprise a handle distal end **1101** and a handle proximal end **1102**. In one or more embodiments, handle **1100** may comprise a handle base **1110**, an actuation channel **1120** having an actuation channel distal end **1121** and an actuation channel proximal end **1122**, and a pivot pin housing **1130**. FIG. **11**B illustrates a cross-sectional view of handle **1100**. Illustratively, handle **1100** may comprise a pulley mechanism housing **1135**, an inner bore **1140**, an inner bore distal chamber **1150**, and an optic fiber guide **1160**. Handle **1100** may be manufactured from any suitable material, e.g., polymers, metals, metal alloys, etc., or from any combination of suitable materials.

FIG. **12** is a schematic diagram illustrating an exploded view of a steerable laser probe assembly **1200**. In one or more embodiments, a steerable laser probe assembly **1200** may comprise a handle **1100**, a housing tube **700** having a housing tube distal end **701** and a housing tube proximal end **702**, an optic fiber **750** having an optic fiber distal end **751** and an optic fiber proximal end **752**, a pulley mechanism **1205**, a pivot pin **1210**, an actuation lever **1220** having an actuation lever distal end **1221** and an actuation lever proximal end **1222**, a draw wire **1240** having a draw wire distal end **1241** and a draw wire proximal end **1242**, and a light source interface **830**. Illustratively, light source interface **830** may be configured to interface with optic fiber proximal end **752**. In one or more embodiments, light source interface **830** may comprise a standard light source connector, e.g., an SMA connector.

Illustratively, actuation lever **1220** may comprise a pivot pin guide **1225**. In one or more embodiments, pivot pin **1210** may be disposed within pivot pin housing **1130** and pivot pin guide **1225**. Illustratively, pivot pin **1210** may be configured to fix a portion of actuation lever **1220** to a portion of handle **1100**. In one or more embodiments, pivot pin **1210** may be fixed in a position within pivot pin housing **1130**. For example, pivot pin **1210** may be fixed in a position within pivot pin housing **1130**, e.g., by an adhesive or any other suitable fixation means.

Illustratively, housing tube **700** may be fixed to handle **1100**, e.g., housing tube proximal end **702** may be fixed to handle distal end **1101**. In one or more embodiments, housing tube **700** may be fixed to handle **1100**, e.g., by an adhesive or any suitable fixation means. Illustratively, housing tube **700** may comprise a first housing tube portion **720** having a first stiffness and a second housing tube portion **730** having a second stiffness. In one or more embodiments, the second stiffness may be greater than the first stiffness.

Illustratively, pulley mechanism **1205** may be disposed within pulley mechanism housing **1135**. In one or more embodiments, pulley mechanism **1205** may be configured to change a direction of an applied force, e.g., a force applied to draw wire **1240**. For example, pulley mechanism **1205** may comprise any suitable mechanism configured to change a direction of an applied force. Illustratively, pulley mechanism **1205** may be configured to change a point of application of an applied force, e.g., by changing a direction of an applied force. For example, pulley mechanism **1205** may be configured to change a direction and a point of application of an applied force, e.g., a force applied to draw wire **1240**. In one or more embodiments, pulley mechanism **1205** may comprise a rod configured to change a direction of an applied force, e.g., a force applied to draw wire **1240**. For example, pulley mechanism **1205** may comprise a rod configured to change a point of application of an applied force, e.g., a force applied to draw wire **1240**. Illustratively, pulley mechanism **1205** may comprise one or more channels configured to, e.g., interface with a portion of draw wire **1240**. In one or more embodiments, a portion of pulley mechanism **1205** may be coated with a lubricant, e.g., Teflon, configured to minimize a force of friction between pulley mechanism **1205** and draw wire **1240**. Illustratively, pulley mechanism **1205** may be configured to rotate, e.g., to change a direction of an applied force, or a portion of pulley mechanism **1205**, e.g., a wheel, may be configured to rotate, e.g., to change a direction of an applied force. For example, pulley mechanism **1205** or a portion of pulley mechanism **1205** may be configured to change a point of application of an applied force, e.g., a force applied to draw wire **1240**. In one or more embodiments, pulley mechanism **1205** may be configured to remain in static equilibrium, e.g., not to rotate, to change a direction of an applied force, e.g., a force applied to draw wire **1240**. For example, a change in a direction of an applied force may be configured to change one or more points of application of the applied force. Illustratively, a portion of pulley mechanism **1205** may be configured to house a portion of optic fiber **750**.

In one or more embodiments, draw wire proximal end **1242** may be fixed to actuation lever proximal end **1222**. Illustratively, draw wire proximal end **1242** may be fixed to actuation lever proximal end **1222**, e.g., by an adhesive or any other suitable fixation means. Illustratively, actuation lever **1220** may comprise a draw wire proximal end housing **1226**. In one or more embodiments, draw wire proximal end **1242** may be fixed within draw wire proximal end housing **1226**, e.g., by an adhesive or any suitable fixation means.

Illustratively, a portion of draw wire **1240** may comprise a draw wire loop **1245**. In one or more embodiments, pulley mechanism **1205** may be disposed within draw wire loop **1245**. For example, draw wire loop **1245** may be looped around pulley mechanism **1205**. Illustratively, draw wire **1240** may be disposed within inner bore **1140**, actuation channel **1120**, inner bore distal chamber **1150**, optic fiber guide **1160**, and housing tube **700**. In one or more embodiments, draw wire **1240** may be disposed within housing tube **700** wherein draw wire distal end **1241** may be adjacent to housing tube distal end **701**. Illustratively, draw wire **1240** may be disposed within housing tube **700** wherein a portion of draw wire **1240** may be adjacent to a portion of first housing tube portion **720**. In one or more embodiments, a portion of draw wire **1240** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or by any other suitable fixation means.

Illustratively, optic fiber **750** may be disposed within inner bore **1140**, actuation channel **1120**, inner bore distal chamber **1150**, optic fiber guide **1160**, and housing tube **700**. In one or more embodiments, optic fiber **750** may be disposed within housing tube **700** wherein optic fiber distal end **751** may be adjacent to housing tube distal end **701**. Illustratively, a portion of optic fiber **750** may be fixed to an inner portion of housing tube **700**, e.g., by a biocompatible adhesive or by any other suitable fixation means.

In one or more embodiments, an application of a force to actuation lever **1220** may be configured to actuate actuation lever **1220**, e.g., within actuation channel **1120**. Illustratively, an application of a force to actuation lever **1220** may be configured to rotate actuation lever **1220** about pivot pin **1210**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to rotate actuation lever distal end **1221** and actuation lever proximal end **1222** about pivot pin **1210**, e.g., in a counter-clockwise direction. Illustratively, an application of a force to actuation lever **1220** may be configured to actuate actuation lever distal end **1221** towards handle proximal end **1102** and configured to actuate actuation lever proximal end **1222** away from handle proximal end **1102**. For example, an application of a force to actuation lever **1220** may be configured to extend actuation lever proximal end **1222** relative to handle base **1110**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to extend draw wire proximal end **1242** relative to handle proximal end **1102**.

Illustratively, an actuation of actuation lever proximal end **1222** away from handle proximal end **1102**, e.g., due to an application of a force to actuation lever **1220**, may be configured to extend draw wire proximal end **1242** relative to handle proximal end **1102**. For example, an actuation of actuation lever proximal end **1222** away from handle proximal end **1102** may be configured to pull draw wire proximal end **1242** away from handle proximal end **1102**. In one or more embodiments, pulley mechanism **1205** may be configured to change a direction and a point of application of a force configured to extend draw wire proximal end **1242** relative to handle proximal end **1102**. Illustratively, pulley mechanism may **1205** be configured to change a direction and a point of application of a force from a force configured to extend draw wire proximal end **1242** relative to handle proximal end **1102** to a force configured to retract draw wire distal end **1241** relative to handle proximal end **1102**. In one or more embodiments, an actuation of actuation lever proximal end **1222** away from handle proximal end **1102** may be configured to retract draw wire distal end **1241** towards handle proximal end **1102**. Illustratively, an extension of actuation lever proximal end **1222** and draw wire proximal end **1242** relative to handle proximal end **1102** may be configured to retract draw wire **1240**, e.g., to retract draw wire distal end **1241**, relative to housing tube **700**.

In one or more embodiments, a retraction of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually compress a portion of housing tube **700**, e.g., a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a gradual compression of a portion of housing tube **700** may be configured to cause housing tube **700** to gradually curve. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**.

In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to actuate actuation lever **1220**, e.g., within actuation channel **1120**. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to rotate actuation lever **1220** about pivot pin **1210**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to rotate actuation lever distal end **1221** and actuation lever proximal end **1222** about pivot pin **1210**, e.g., in a clockwise direction. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to actuate actuation lever distal end **1221** away from handle proximal end **1102** and configured to actuate actuation lever proximal end **1222** towards proximal end **1102**. For example, a reduction of a force applied to actuation lever **1220** may be configured to retract actuation lever proximal end **1222** relative to handle base **1110**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to retract draw wire proximal end **1242** relative to handle proximal end **1102**.

Illustratively, an actuation of actuation lever proximal end **1222** towards handle proximal end **1102**, e.g., due to a reduction of a force applied to actuation lever **1220**, may be configured to retract draw wire proximal end **1242** relative to handle proximal end **1102**. In one or more embodiments, pulley mechanism **1205** may be configured to change a direction and a point of application of a force configured to retract draw wire proximal end **1242** relative to handle proximal end **1102**. Illustratively, pulley mechanism may **1205** be configured to change a direction and a point of application of a force from a force configured to retract draw wire proximal end **1242** relative to handle proximal end **1102** to a force configured to extend draw wire distal end **1241** relative to handle proximal end **1102**. In one or more embodiments, an actuation of actuation lever proximal end **1222** towards handle proximal end **1102** may be configured to extend draw wire distal end **1241** away from handle proximal end **1102**. Illustratively, a retraction of actuation lever proximal end **1222** and draw wire proximal end **1242** relative to handle proximal end **1102** may be configured to extend draw wire **1240**, e.g., to extend draw wire distal end **1241**, relative to housing tube **700**.

In one or more embodiments, an extension of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually decompress a portion of housing tube **700**, e.g., a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a gradual decompression of a portion of housing tube **700** may be configured to cause housing tube **700** to gradually straighten. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**.

FIGS. **13**A, **13**B, **13**C, **13**D, and **13**E illustrate a gradual curving of an optic fiber **750**. FIG. **13**A illustrates a straight optic fiber **1300**. In one or more embodiments, optic fiber **750** may comprise a straight optic fiber **1300**, e.g., when actuation lever proximal end **1222** is fully retracted relative to handle base **1110**. Illustratively, optic fiber **750** may comprise a straight optic fiber **1300**, e.g., when first housing tube portion **720** is fully decompressed. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises a straight optic fiber **1300**.

FIG. **13**B illustrates an optic fiber in a first curved position **1310**. Illustratively, an actuation of actuation lever **1220**, e.g., in a counter-clockwise direction about pivot pin **1210**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to an application of a force to actuation lever **1220**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to gradually curve optic fiber **750** from a straight optic fiber **1300** to an optic fiber in a first curved position **1310**. Illustratively, an application of a force to actuation lever **1220** may be configured to gradually retract draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual retraction of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from a straight optic fiber **1300** to an optic fiber in a first curved position **1310**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a first angle, e.g., when optic fiber **750** comprises an optic fiber in a first curved position **1310**. Illustratively, the first angle may comprise any angle greater than zero degrees. For example, the first angle may comprise a 45 degree angle.

FIG. **13**C illustrates an optic fiber in a second curved position **1320**. Illustratively, an actuation of actuation lever **1220**, e.g., in a counter-clockwise direction about pivot pin **1210**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to an application of a force to actuation lever **1220**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to gradually curve optic fiber **750** from an optic fiber in a first curved position **1310** to an optic fiber in a second curved position **1320**. Illustratively, an application of a force to actuation lever **1220** may be configured to gradually retract draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual retraction of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a first curved position **1310** to an optic fiber in a second curved position **1320**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a second angle, e.g., when optic fiber **750** comprises an optic fiber in a second curved position **1320**. Illustratively, the second angle may comprise any angle greater than the first angle. For example, the second angle may comprise a 90 degree angle.

FIG. **13**D illustrates an optic fiber in a third curved position **1330**. Illustratively, an actuation of actuation lever **1220**, e.g., in a counter-clockwise direction about pivot pin **1210**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to an application of a force to actuation lever **1220**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to gradually curve optic fiber **750** from an optic fiber in a second curved position **1320** to an optic fiber in a third curved position **1330**. Illustratively, an application of a force to actuation lever **1220** may be configured to gradually retract draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual retraction of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a second curved position **1320** to an optic fiber in a third curved position **1330**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a third angle, e.g., when optic fiber **750** comprises an optic fiber in a third curved position **1330**. Illustratively, the third angle may comprise any angle greater than the second angle. For example, the third angle may comprise a 135 degree angle.

FIG. **13**E illustrates an optic fiber in a fourth curved position **1340**. Illustratively, an actuation of actuation lever **1220**, e.g., in a counter-clockwise direction about pivot pin **1210**, may be configured to gradually curve optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to an application of a force to actuation lever **1220**, may be configured to gradually curve optic fiber **750**. In one or more embodiments, an application of a force to actuation lever **1220** may be configured to gradually curve optic fiber **750** from an optic fiber in a third curved position **1330** to an optic fiber in a forth curved position **1340**. Illustratively, an application of a force to actuation lever **1220** may be configured to gradually retract draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual retraction of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to apply a compressive force to an inner portion of housing tube **700**. Illustratively, an application of a compressive force to an inner portion of housing tube **700** may be configured to compress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, an application of a compressive force to an inner portion of housing tube **700** may be configured to gradually curve housing tube **700**. Illustratively, a gradual curving of housing tube **700** may be configured to gradually curve optic fiber **750**, e.g., from an optic fiber in a third curved position **1330** to an optic fiber in a fourth curved position **1340**. For example, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises an optic fiber in a fourth curved position **1340**.

In one or more embodiments, one or more properties of a steerable laser probe may be adjusted to attain one or more desired steerable laser probe features. For example, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. Illustratively, a material comprising first housing tube portion **720** or a material comprising second housing tube portion **730** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position.

In one or more embodiments, a number of apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. Illustratively, a location of one or more apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. In one or more embodiments, a geometry of one or more apertures in housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. Illustratively, a geometry of one or more apertures in housing tube **700** may be uniform, e.g., each aperture of the one or more apertures may have a same geometry. In one or more embodiments, a geometry of one or more apertures in housing tube **700** may be non-uniform, e.g., a first aperture in housing tube **700** may have a first geometry and a second aperture in housing tube **700** may have a second geometry.

Illustratively, a geometry or shape of actuation lever **1220** may be adjusted to vary an amount actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. In one or more embodiments, one or more locations within housing tube **700** wherein draw wire **1240** may be fixed to an inner portion of housing tube **700** may be adjusted to vary an amount of actuation of actuation lever **1220** configured to curve housing tube **700** to a particular curved position. Illustratively, a portion of draw wire **1240** may be fixed to an outer portion of housing tube **700**. In one or more embodiments, a portion of draw wire **1240** may be looped around a portion of housing tube **700**. Illustratively, a portion of housing tube **700** may comprise an access window, e.g., configured to allow access to an inner portion of housing tube **700**. In one or more embodiments, a portion of housing tube **700** may comprise an access window, e.g., configured to allow access to a portion of optic fiber **750** or a portion of draw wire **1240**. Illustratively, at least a portion of optic fiber **750** may be enclosed in an optic fiber sleeve configured to, e.g., protect optic fiber **750**, vary a stiffness of optic fiber **750**, vary an optical property of optic fiber **750**, etc.

In one or more embodiments, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a stiffness of first housing tube portion **720** or a stiffness of second housing tube portion **730** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position. In one or more embodiments, a number of apertures in housing tube **700** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a number of apertures in housing tube **700** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position. In one or more embodiments, a location or a geometry of one or more apertures in housing tube **700** may be adjusted to vary a bend radius of housing tube **700**. Illustratively, a location or a geometry of one or more apertures in housing tube **700** may be adjusted to vary a radius of curvature of housing tube **700**, e.g., when housing tube **700** is in a particular curved position.

FIGS. **14**A, **14**B, **14**C, **14**D, and **14**E illustrate a gradual straightening of an optic fiber **750**. FIG. **14**A illustrates a fully curved optic fiber **1400**. In one or more embodiments, optic fiber **750** may comprise a fully curved optic fiber **1400**, e.g., when actuation lever proximal end **1222** is fully extended relative to handle base **1110**. Illustratively, optic fiber **750** may comprise a fully curved optic fiber **1400**, e.g., when first housing tube portion **720** is fully compressed. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises a fully curved optic fiber **1400**.

FIG. **14**B illustrates an optic fiber in a first partially straightened position **1410**. Illustratively, an actuation of actuation lever **1220**, e.g., in a clockwise direction about pivot pin **1210**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to a reduction of a force applied to actuation lever **1220**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to gradually straighten optic fiber **750** from a fully curved optic fiber **1400** to an optic fiber in a first partially straightened position **1410**. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to gradually extend draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual extension of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from a fully curved optic fiber **1400** to an optic fiber in a first partially straightened position **1410**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a first partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a first partially straightened position **1410**. Illustratively, the first partially straightened angle may comprise any angle less than 180 degrees. For example, the first partially straightened angle may comprise a 135 degree angle.

FIG. **14**C illustrates an optic fiber in a second partially straightened position **1420**. Illustratively, an actuation of actuation lever **1220**, e.g., in a clockwise direction about pivot pin **1210**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to a reduction of a force applied to actuation lever **1220**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to gradually straighten optic fiber **750** from an optic fiber in a first partially straightened position **1410** to an optic fiber in a second partially straightened position **1420**. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to gradually extend draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual extension of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a first partially straightened position **1410** to an optic fiber in a second partially straightened position **1420**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a second partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a second partially straightened position **1420**. Illustratively, the second partially straightened angle may comprise any angle less than the first partially straightened angle. For example, the second partially straightened angle may comprise a 90 degree angle.

FIG. **14**D illustrates an optic fiber in a third partially straightened position **1430**. Illustratively, an actuation of actuation lever **1220**, e.g., in a clockwise direction about pivot pin **1210**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to a reduction of a force applied to actuation lever **1220**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to gradually straighten optic fiber **750** from an optic fiber in a second partially straightened position **1420** to an optic fiber in a third partially straightened position **1430**. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to gradually extend draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual extension of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a second partially straightened position **1420** to an optic fiber in a third partially straightened position **1430**. In one or more embodiments, a line tangent to optic fiber distal end **751** may intersect a line tangent to housing tube proximal end **702** at a third partially straightened angle, e.g., when optic fiber **750** comprises an optic fiber in a third partially straightened position **1430**. Illustratively, the third partially straightened angle may comprise any angle less than the second partially straightened angle. For example, the third partially straightened angle may comprise a 45 degree angle.

FIG. **14**E illustrates an optic fiber in a fully straightened position **1440**. Illustratively, an actuation of actuation lever **1220**, e.g., in a clockwise direction about pivot pin **1210**, may be configured to gradually straighten optic fiber **750**. For example, an actuation of actuation lever **1220**, e.g., due to a reduction of a force applied to actuation lever **1220**, may be configured to gradually straighten optic fiber **750**. In one or more embodiments, a reduction of a force applied to actuation lever **1220** may be configured to gradually straighten optic fiber **750** from an optic fiber in a third partially straightened position **1430** to an optic fiber in a fully straightened position **1440**. Illustratively, a reduction of a force applied to actuation lever **1220** may be configured to gradually extend draw wire **1240** relative to housing tube **700**. In one or more embodiments, a gradual extension of draw wire **1240** relative to housing tube **700** may be configured to cause draw wire **1240** to reduce a compressive force applied to an inner portion of housing tube **700**. Illustratively, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to decompress a first housing tube portion **720** of housing tube **700**. In one or more embodiments, a reduction of a compressive force applied to an inner portion of housing tube **700** may be configured to gradually straighten housing tube **700**. Illustratively, a gradual straightening of housing tube **700** may be configured to gradually straighten optic fiber **750**, e.g., from an optic fiber in a third partially straightened position **1430** to an optic fiber in a fully straightened position **1440**. In one or more embodiments, a line tangent to optic fiber distal end **751** may be parallel to a line tangent to housing tube proximal end **702**, e.g., when optic fiber **750** comprises an optic fiber in a fully straightened position **1440**.

Illustratively, a surgeon may aim optic fiber distal end **751** at any of a plurality of targets within an eye, e.g., to perform a photocoagulation procedure. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target within a particular transverse plane of the inner eye by, e.g., rotating handle **1100** to orient housing tube **700** in an orientation configured to cause a curvature of housing tube **700** within the particular transverse plane of the inner eye and varying an amount of actuation of actuation lever **1220**. Illustratively, a surgeon may aim optic fiber distal end **751** at any target within a particular sagittal plane of the inner eye by, e.g., rotating handle **1100** to orient housing tube **700** in an orientation configured to cause a curvature of housing tube **700** within the particular sagittal plane of the inner eye and varying an amount of actuation of actuation lever **1220**. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target within a particular frontal plane of the inner eye by, e.g., varying an amount of actuation of actuation lever **1220** to orient a line tangent to optic fiber distal end **751** wherein the line tangent to optic fiber distal end **751** is within the particular frontal plane of the inner eye and rotating handle **1100**. Illustratively, a surgeon may aim optic fiber distal end **751** at any target located outside of the particular transverse plane, the particular sagittal plane, and the particular frontal plane of the inner eye, e.g., by varying a rotational orientation of handle **1100** and varying an amount of actuation of actuation lever **1220**. In one or more embodiments, a surgeon may aim optic fiber distal end **751** at any target of a plurality of targets within an eye, e.g., without increasing a length of a portion of a steerable laser probe within the eye. Illustratively, a surgeon may aim optic fiber distal end **751** at any target of a plurality of targets within an eye, e.g., without decreasing a length of a portion of a steerable laser probe within the eye.

The foregoing description has been directed to particular embodiments of this invention. It will be apparent; however, that other variations and modifications may be made to the described embodiments, with the attainment of some or all of their advantages. Specifically, it should be noted that the principles of the present invention may be implemented in any probe system. Furthermore, while this description has been written in terms of a steerable laser probe, the teachings of the present invention are equally suitable to systems where the functionality of actuation may be employed. Therefore, it is the object of the appended claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

What is claimed is:

1. An instrument comprising:

a handle having a handle distal end and a handle proximal end;

an actuation channel of the handle, the actuation channel having an actuation channel distal end and an actuation channel proximal end wherein the actuation channel distal end is disposed between the handle distal end and the handle proximal end and the actuation channel proximal end is disposed between the handle distal end and the handle proximal end;

an actuation lever having an actuation lever distal end and an actuation lever proximal end wherein the actuation lever proximal end is disposed in the actuation channel between the actuation channel distal end and the actuation channel proximal end and the actuation lever distal end extends out from the actuation channel;

a pivot pin disposed in a pivot pin housing of the handle and a pivot pin guide of the actuation lever wherein the actuation lever is configured to rotate about the pivot in a first direction and a second direction;

a housing tube having a housing tube distal end and a housing tube proximal end, the housing tube having dimensions configured to perform an ophthalmic surgical procedure;

a first housing tube portion of the housing tube, the first housing tube portion having a first stiffness;

a plurality of slits of the first housing tube portion, each slit of the plurality of slits having an arch configured to minimize a force of friction between the housing tube and a cannula;

a second housing tube portion of the housing tube, the second housing tube portion having a second stiffness wherein the second stiffness is greater than the first stiffness;

an optic fiber having an optic fiber distal end and an optic fiber proximal end, the optic fiber disposed in an inner bore of the handle and the housing tube wherein the optic fiber is fixed within an inner portion of the housing tube and the optic fiber distal end is adjacent to the housing tube distal end;

a wire proximal loop housing of the actuation lever; and

a wire having a wire distal end and a wire proximal loop, the wire disposed in the housing tube, the inner bore of the handle, and the wire proximal loop housing of the actuation lever wherein the wire is fixed within the inner portion of the housing tube and the wire distal end is adjacent to the optic fiber distal end and the housing tube distal end and wherein varying an amount of actuation of the actuation lever is configured to aim the optic fiber distal end at a surgical target within an eye without increasing a length of the instrument within the eye and without decreasing the length of the instrument within the eye.

2. The instrument of claim **1** wherein an actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber.

3. The instrument of claim **2** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the housing tube.

4. The instrument of claim **3** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to compress the first housing tube portion.

5. The instrument of claim **1** wherein an actuation of the actuation lever about the pivot pin in the second direction is configured to gradually straighten the optic fiber.

6. The instrument of claim **5** wherein the actuation of the actuation lever about the pivot pin in the second direction is configured to gradually straighten the housing tube.

7. The instrument of claim **6** wherein the actuation of the actuation lever about the pivot pin in the second direction is configured to decompress the first housing tube portion.

8. The instrument of claim **1** further comprising:

an access window of the housing tube, the access window configured to allow access to the inner portion of the housing tube.

9. The instrument of claim **2** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber more than 90 degrees.

10. The instrument of claim **9** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber more than 135 degrees.

11. An instrument comprising:

a handle having a handle distal end and a handle proximal end;

an actuation channel of the handle, the actuation channel having an actuation channel distal end and an actuation channel proximal end wherein the actuation channel distal end is disposed between the handle distal end and the handle proximal end and the actuation channel proximal end is disposed between the handle distal end and the handle proximal end;

an actuation lever having an actuation lever distal end and an actuation lever proximal end wherein the actuation lever proximal end is disposed in the actuation channel between the actuation channel distal end and the actuation channel proximal end and the actuation lever distal end extends out from the actuation channel;

a pivot pin disposed in a pivot pin housing of the handle and a pivot pin guide of the actuation lever wherein the actuation lever is configured to rotate about the pivot in a first direction and a second direction;

a housing tube having a housing tube distal end and a housing tube proximal end, the housing tube having dimensions configured to perform an ophthalmic surgical procedure;

a first housing tube portion of the housing tube, the first housing tube portion having a first stiffness;

a plurality of slits of the first housing tube portion, each slit of the plurality of slits having an arch configured to minimize a force of friction between the housing tube and a cannula;

a second housing tube portion of the housing tube, the second housing tube portion having a second stiffness wherein the second stiffness is greater than the first stiffness;

an optic fiber having an optic fiber distal end and an optic fiber proximal end, the optic fiber disposed in an inner bore of the handle and the housing tube wherein the optic fiber is fixed within an inner portion of the housing tube and the optic fiber distal end is adjacent to the housing tube distal end;

a pulley mechanism of the handle;

and a draw wire having a draw wire distal end and a draw wire proximal end, the draw wire distal end disposed in the housing tube and the draw wire proximal end disposed in a draw wire proximal end housing of the actuation lever wherein the draw wire is fixed within the inner portion of the housing tube and the draw wire distal end is adjacent to the optic fiber distal end and the housing tube distal end and wherein varying an amount of actuation of the actuation lever is configured to aim the optic fiber distal end at a surgical target within an eye without increasing a length of the instrument within the eye and without decreasing the length of the instrument within the eye.

12. The instrument of claim **11** wherein an actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber.

13. The instrument of claim **12** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber more than 90 degrees.

14. The instrument of claim **13** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the optic fiber more than 135 degrees.

15. The instrument of claim **12** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to gradually curve the housing tube.

16. The instrument of claim **15** wherein the actuation of the actuation lever about the pivot pin in the first direction is configured to compress the first housing tube portion.

17. The instrument of claim **11** wherein an actuation of the actuation lever about the pivot pin in the second direction is configured to gradually straighten the optic fiber.

18. The instrument of claim **17** wherein the actuation of the actuation lever about the pivot pin in the second direction is configured to gradually straighten the optic fiber more than 90 degrees.

19. The instrument of claim **18** wherein the actuation of the actuation lever about the pivot pin in the second direction is configured to gradually straighten the optic fiber more than 135 degrees.

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